The FOUNDRY

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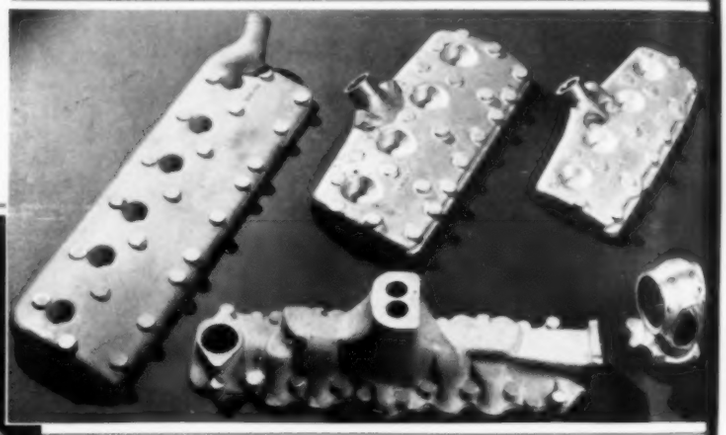

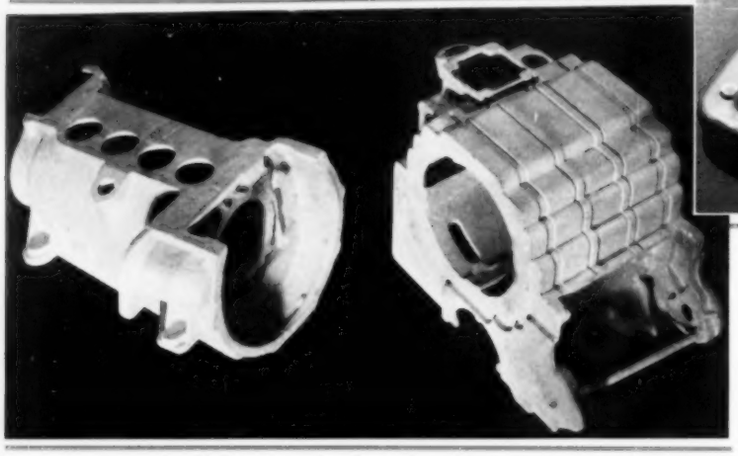

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Editorial

Medal Recognizes Effort Toward World Understanding

ELSEWHERE this issue announces that Vincent Delport, European manager of THE FOUNDRY, has been awarded the gold medal of the Association Technique de Fonderie for his activities in endeavoring to develop and maintain goodwill and friendly relationships between the foundry associations of the various countries. Naturally, THE FOUNDRY is proud that a member of its staff has been selected for this singular honor by the foundrymen of France through the Association Technique de Fonderie.

For fourteen years, Mr. Delport has fostered the exchange of foundry information among the nations of the world. He has been a member of the International Relations committee and European representative of the American Foundrymen's association since 1925. He has attended practically all of the major foundry congresses in England and on the Continent, and visited the United States for the Syracuse convention of the A.F.A. in 1925, and the International Foundry congress in Philadelphia in 1934. In 1936, during the International Foundry congress in Dusseldorf, Germany, he was elected president of the International Committee of Foundry Technical associations, which has included among its members representatives from Great Britain, France, Germany, Czechoslovakia, Holland, Italy, Poland, Spain and the United States. Mr. Delport has been active in British foundry circles, is a past president of the London branch of the Institute of British Foundrymen and has served as a council member of that organization.

Last Fall during the crisis in Central Europe, Mr. Delport attended the International Foundry congress at Warsaw, Poland. Regardless of the tension which gripped the governments of the world, the meeting was held in an atmosphere of good followship and mutual consideration. Perhaps the philosophy which has guided Mr. Delport in his work best is expressed in the following paragraph from his report of that congress:

It was said on more than one occasion, and from opposite sides, that if political negotiations were conducted between peoples and statesmen with the same restraint as was evident at the congress, the path of nations would be much smoother than it is. Here is a valuable feature to be placed to the credit of international technical and scientific meetings, among which foundry meetings play a conspicuous part.

Unfair Specification

RECOGNIZED organizations for the promulgation of industrial standards provide the means for fair treatment for both producer and consumer. When one party in the transaction departs from organized procedure to originate private specifications, demands often become exceedingly unfair.

An example is found in the following from a recent specification of the Chesapeake & Ohio Railway Co. covering equipment for special gantry cranes for unloading ore and bulk material from ships.

All equipment shall be guaranteed against defects of material and workmanship for a period of two years, with the exception of castings, which shall be guaranteed for five years. Any part failing during these periods from either of the above causes shall be replaced free of cost to the railway company.

Such a demand included in a materials specification, constitutes a direct attack upon the reputation and product of the foundry industry. It questions the ability of foundrymen to produce engineering materials capable of competing on an equal basis with those made by other methods of fabrication. Perhaps this specification was developed for the express purpose of preventing the foundry industry from selling its product for that particular application.

Foundrymen can produce castings which will meet all requirements for which the equipment is designed. But what is to prevent abuse in service being attributed by the operator to casting failure under normal operating conditions? Who is to be the judge of responsibility for failure? No foundry can afford to sell on such an unfair specification.

For many years the railroads have depended on castings to a large extent, especially in motive power and rolling stock. Castings have met every new demand of the railroads for increased loads and speeds. Without high class castings, the C & O would be operating mule teams instead of the giant locomotives that drag enormous coal trains through the mountains of Virginia and West Virginia to the markets.

Undoubtedly the foundry industry would profit by laying certain educational and economic features of castings before the railroads.

Frank G. Steinebach
Editor

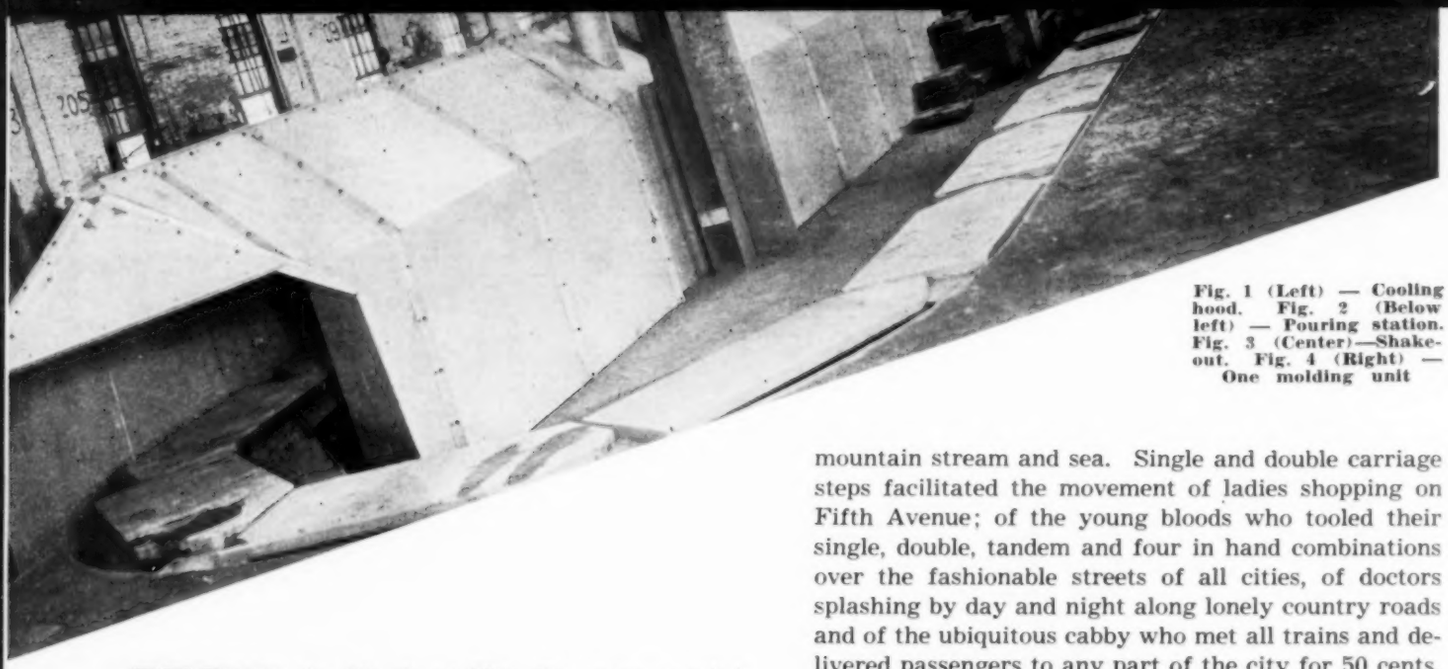


Fig. 1 (Left) — Cooling hood. Fig. 2 (Below left) — Pouring station. Fig. 3 (Center)—Shakeout. Fig. 4 (Right) — One molding unit

Modernizes

WHEN the Eberhard Mfg. Co., now a subsidiary of the Eastern Malleable Iron Co., decided some 60 years ago to build a plant for the manufacture of saddlery, harness and carriage hardware castings, the site chosen was a farm on the outskirts of Cleveland. Tradition has it that the sterling husbandman, owner of the property, held up building operations until after he had dug up his fields of potatoes, shocked his corn and gathered into his barn all other eatable or negotiable results of his labor for the season. After the fashion of all large American cities the plant soon was surrounded with buildings of all kinds, dwellings, business establishments and factories extending for miles north, south and east.

For many years the entire product of the plant was confined to the horse and carriage field and a substantial market was developed in many foreign countries in addition to the steadily increasing market in the United States. As with Mrs. Heman's well known *Graves of a Household,* the castings grew in beauty side by side and then were scattered far and wide by mountain stream and sea. Single and double carriage steps facilitated the movement of ladies shopping on Fifth Avenue; of the young bloods who tooled their single, double, tandem and four in hand combinations over the fashionable streets of all cities, of doctors splashing by day and night along lonely country roads and of the ubiquitous cabby who met all trains and delivered passengers to any part of the city for 50 cents.

Castings from a given heat might be separated to turn up eventually and simultaneously on the Champs Elysees, Rotten Row, Unter den Linden, the Rua Ouvidor or Beira Mar in Rio Janerio or the Plaza de Mayo in Buenos Aires. Bits, spurs, stirrup irons and jingling bridle chains in almost endless variety might be cast and shaken out on any given day of the year, hustled through the hard iron tumblers, soaked in the annealing ovens for a week, tumbled again, sorted, finished and delivered to the shipping department. Six months later certain items from the original batch might be doing duty wherever horses are used for pleasure, sport or business from the Arctic circle to Patagonia. Spurs that grew in beauty side by side in

An Ancient Foundry

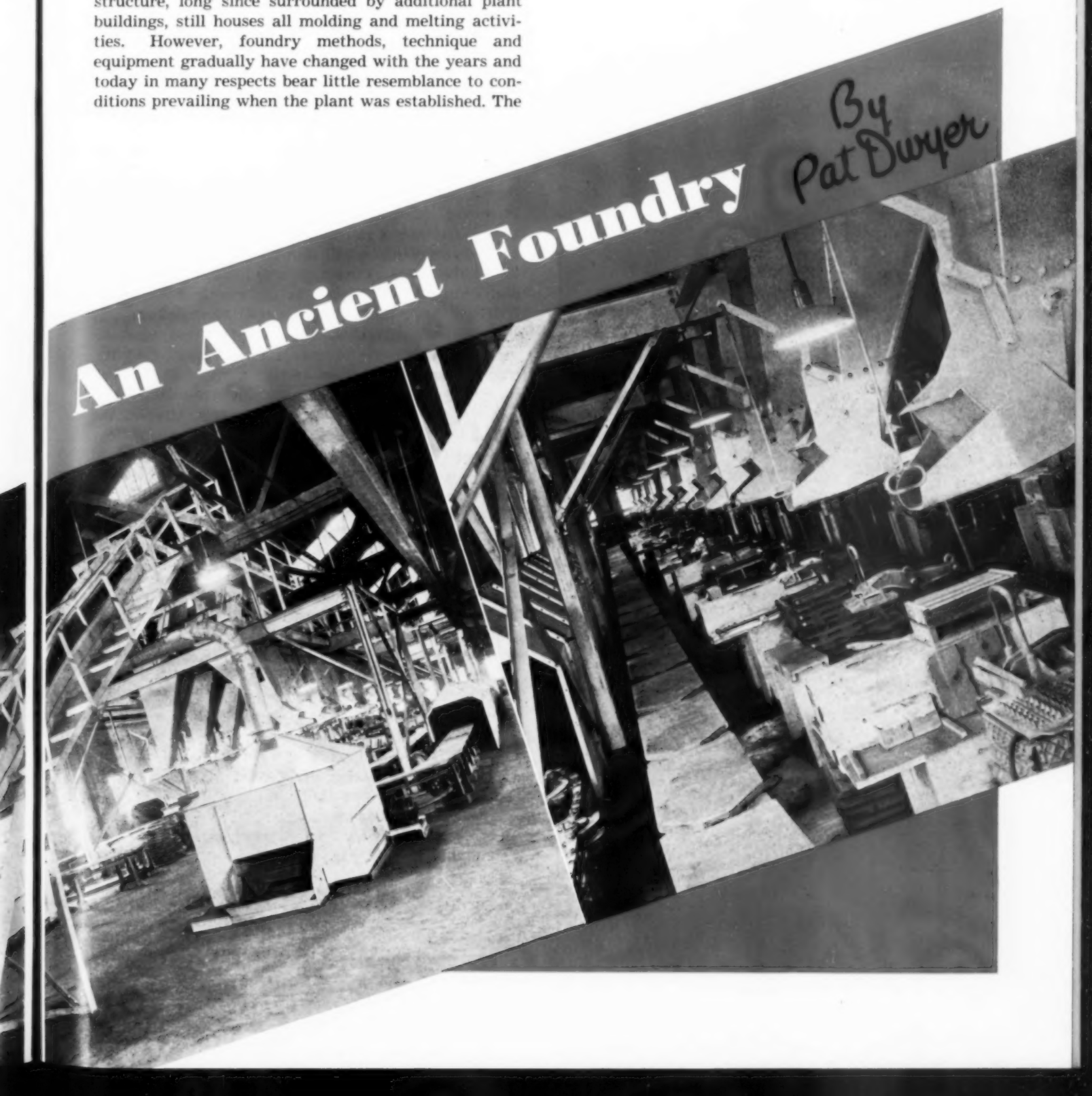
By Pat Dwyer

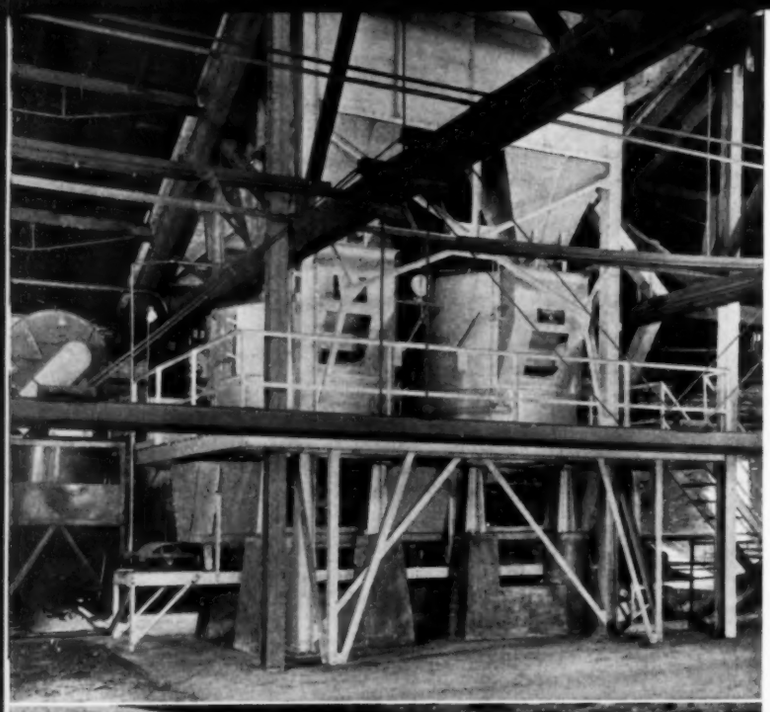
a Cleveland foundry might be sent north, south, east and west to appear later attached to the heels of a Northwest Mountie, symbol of law and order north of 49; a cowboy in the great cattle country between the Canadian and the Rio Grande; a gaily decorated vaquero on a feudal Mexican hacienda; or a wild riding gaucho on the pampas of Argentina.

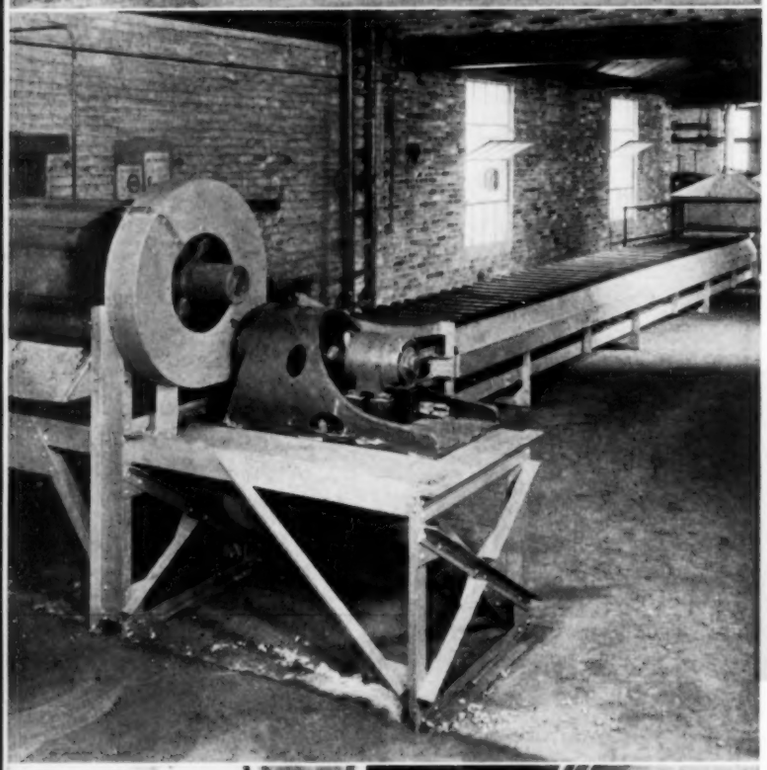
With the coming of the automobile and other radical changes in the buying habits of a nation, the Eberhard Mfg. Co., gradually added many other lines to its list of products. At present the output is about evenly divided between trimmings for the horse and carriage, and a wide miscellany of other fields embraced principally under the broad heading transportation by land, sea and air.

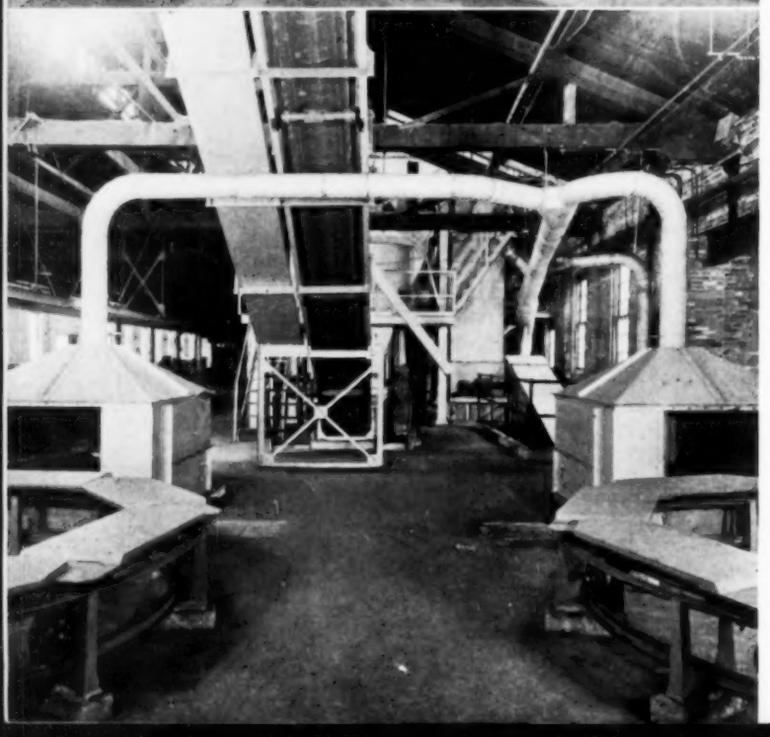
The original foundry building, a substantial brick structure, long since surrounded by additional plant buildings, still houses all molding and melting activities. However, foundry methods, technique and equipment gradually have changed with the years and today in many respects bear little resemblance to conditions prevailing when the plant was established. The five hand-fired air furnaces have been replaced by a duplexing unit in which the metal is melted in a cupola and refined in an air furnace fired with powdered coal. Detailed description of this unit with auxiliary monorail equipment for handling the metal appeared in the January, 1936 issue of THE FOUNDRY. A second similar melting unit recently has been completed and placed in operation.

Recently the company has converted part of one wing of the foundry into a mechanized department with conveyors and a complete sand handling unit designed and installed by the National Engineering Co., Chicago. This new department is located between the original central gangway and one wall, accommodates 32 molders with a total floor area of approxi-









mately 2000 square feet and accounts for a greater casting tonnage than formerly was produced on 50 ordinary type floors 12 x 25 feet or a total area of 15,000 square feet. Many interesting features, some standard and others perculiar to this particular installation, are shown in the accompanying illustrations.

Power operated molding machines made by the Osborn Mfg. Co., Cleveland, are set up in two parallel lines, 16 to a line on opposite sides of a central gangway. The main air pipe or header is suspended from the beams immediately below the apex of the sand bins. An individual air pipe for each machine is attached to the header and then hugs the slope of the bin closely to a point above the gate. The pipe then drops perpendicularly to where a hose connection unites it with the machine. Altogether a very snug and compact arrangement. A double bench between each pair of machines serves as a set-off stand for the copes as they are lifted from the pattern plates. The bench also holds tools, inserts, chills, cores and other miscellaneous requirements in the production of molds.

Use Aluminum Snap Flasks

The molder occupies a small space between the machine and the conveyor and never has to walk more than a step or two in any direction. A hand lever within convenient reaching distance over his head lowers a chute, releases a gate and allows the required amount of prepared sand to fall into his flask. Pressure of a knee valve actuates the squeezing head of the machine and compresses the sand to the required degree of density. After the pattern is drawn the two halves of the mold are assembled and placed on the conveyor line. The sequence of operation is repeated ad lib, without any lost motion and at a speed that seems positively uncanny to any person unfamiliar with modern, high speed production methods. Most of the old time drudgery has been eliminated since the molder no longer has to carry his molds from the machine to various points on the floor. Incidentally, on the new unit aluminum snap flasks are employed.

Molds are carried to the pouring stations and thence to the shakeout on two conveyor lines, one for each battery of molding machines. Since both are alike with the exception that one turns to the right, while the other turns to the left, one description will serve for both. Instead of the usual cast iron or steel plates, the carriers are shallow sheet steel trays filled with a refractory compound which is not affected by dribbles or splashes of molten iron which occasionally may fall through accident. The surface remains perfectly clean, smooth and flat and supports two molds.

The articulated frame supporting the trays is carried on grooved vertical wheels moving over a narrow single rail, one wheel under each tray. Lateral swaying motion is prevented by rollers in contact with guide rails on either side immediately below the trays. It is claimed that this type conveyor presents many advantages including ease of manipulation and instal-

Fig. 5 (Above)—Sand mixing double unit and dust catcher. Fig. 6 (Center)—Casting conveyor equipped with breaking pin hub. Fig. 7 (Below)—Exhaust system draws dust away from the two shakeout stations

lation and minimum power requirement for movement. Power for the drive is supplied by a motor and reduction gear through which the speed may be varied from 12½ to 25 feet per minute.

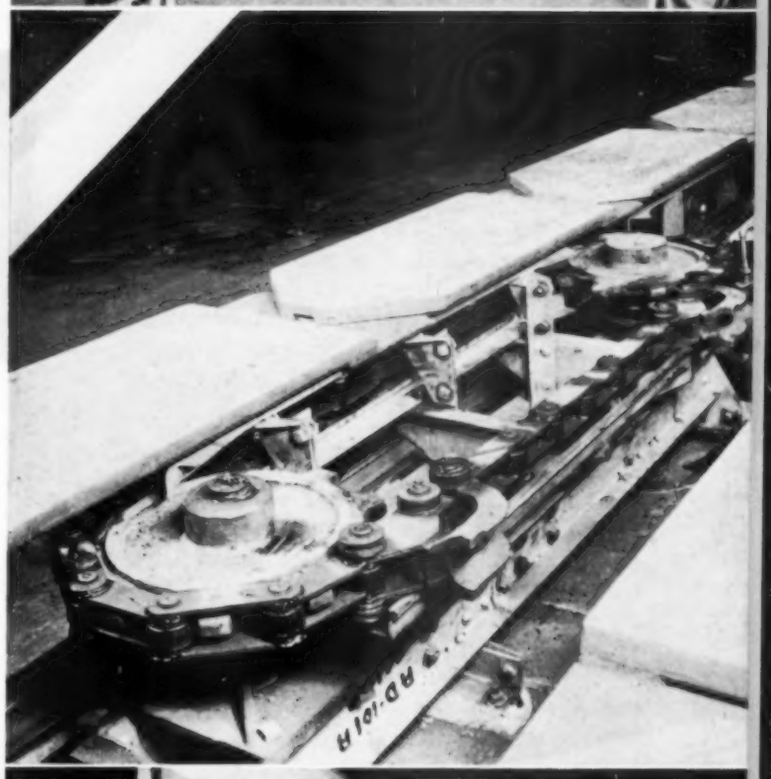
The drive chain revolving around two sprocket wheels as shown in Fig. 1 is equipped with side members or fingers spaced the distance of one mold tray apart. The finger engages a downward projecting member on the carriage and moves the conveyor along one space or until the following finger engages the next member.

After the molds have passed from the molding station they arrive at the pouring floor, a raised section of the floor flush with the trays. At the beginning of this section the conveyor travels around a slight bend as shown to the right in Fig. 2 to provide room for the operators who remove the weights from the poured molds on the left branch of the conveyor and transfer them to the unpoured molds on the right branch. In this manner a minimum number of weights serve for the entire day's operation. A succession of bull ladles suspended from a monorail carry the metal from the furnace to the end of the pouring floor. Here the metal is transferred to hand ladles by which members of the pouring gang fill the molds passing in endless procession.

Dust Removed from Air

Since the character of the castings varies from day to day the volume of iron required may vary from 3 to 4 tons per hour. This factor introduces some nice manipulation in the operation of the cupola and air furnace to supply the exact amount of metal required and at the same time maintain the specified analysis and temperature. After the molds are poured they travel around a *U*-turn and pass under a hood from which smoke and steam are drawn through an 8-inch pipe attached to a central exhaust system. Other branch pipes draw smoke, fumes and dust from the shakeout and sand mixing devices. The material finally enters a wet type dust collector made by the American Air Filter Co., Louisville, Ky., where it is collected and precipitated as sludge.

The hood over the conveyor extends approximately the entire length with the exception of a gap in the center as shown in Fig. 2 where the weights are transferred from the poured to the unpoured molds. Upon emerging from under the hood the molds are dumped by hand on to a vibrating screen set at an incline. Sand falls through the screen on to a cross belt and thence by belt and elevator to the sand preparation station. Castings, gates, sprue and scrap wiggle along the inclined screen and finally drop through an opening in the floor on to a conveyor which reappears above the floor in an adjoining building. As it travels along a number of attendants remove the castings and deposit them in steel drums for removal to the sorting benches and hard iron grinding wheels. Sprue and scrap remain on the con- (*Please turn to page* 68)



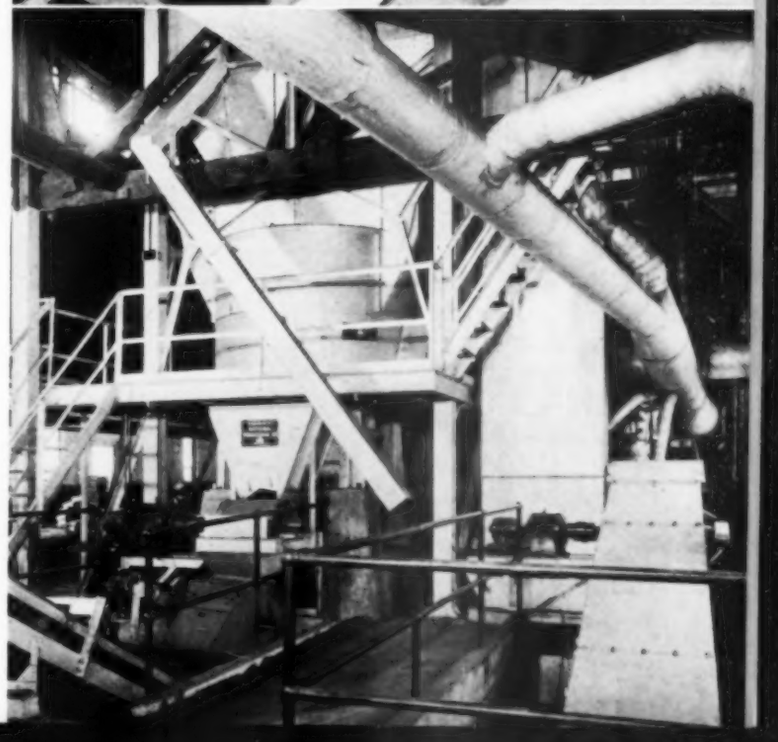
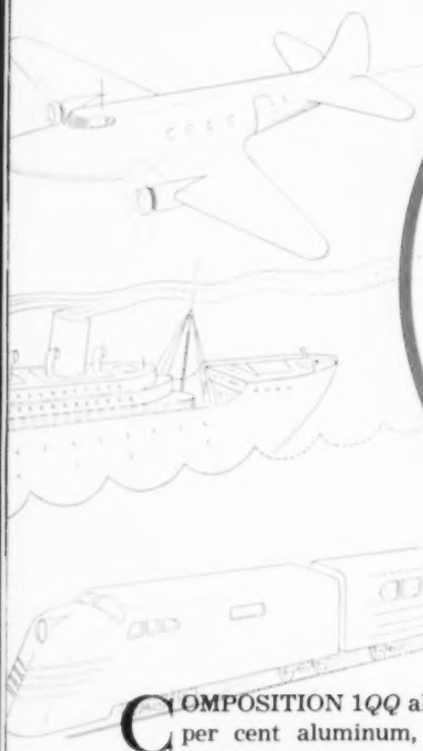


Fig. 8 (Above)—General view of molding stations and sand hoppers. Fig. 9 (Center)—Variable speed mold conveyor drive, chain and sprockets. Fig. 10 (Below)—Magnetic shakeout conveyor and screened sand elevator, enclosed and connected to exhaust system



Many Nonferrous Alloys Available

By N. K. B. PATCH

COMPOSITION 1*QQ* alloy is 90 per cent copper, 10 per cent aluminum, in which no iron is permissible and consequently there is no mention of the presence of tin. The only way tin could become part of the alloy is in the use of iron scrap, some of which is tin plated, thus providing a source of iron. The composition is not used very frequently although it has many characteristics that are valuable. Since it has no iron, it is practically nonmagnetic and yet it is capable of heat treatment to develop a variety of characteristics.

Castings Subject to Corrosive Action

Many of those are similar if not exactly the same as those available in composition 1*RR*, which is practically composition 1*QQ* with the addition of 1 per cent of iron, the iron not being sufficient to combine with enough of the aluminum to prevent the response of the alloy to the proper heat treatment. Composition 1*QQ* being iron free also is preferred frequently for castings that are subjected to the corrosive action of some chemicals that might give trouble were iron present.

Composition 1*RR* is essentially an aluminum bronze with sufficient aluminum to insure a satisfactory ratio of aluminum to copper after satisfying the iron and still respond to heat treatment, thereby developing many of the most valuable characteristics available in the cast aluminum bronzes. The usual desired composition is 89 per cent copper, 10 per cent aluminum, 1 per cent iron.

Up to 0.2 per cent of tin is permissible so that tin plated scrap iron may be the iron content. Brinell hardness may be varied within quite wide limits by the proper application of heat treatment and elongation also is much affected by that treatment. Tensile strength and yield point also are influenced by the proper application of heat treatment.

That composition, as well as composition 1*QQ* are covered by the Federal specification QQB 671 Grade B, the A. S. T. M. B59-36 (B) and S. A. E. 68 (B). In the specifications the requirements for iron are from 0 to 1.25 per cent maximum, so that the specifications cover composition 1*QQ* when there is no iron present, and composition 1*RR* when there is up to 1.25 per cent iron present. In both cases the remainder of aluminum and copper is similar.

Those compositions are used largely for high strength parts in a wide variety of different types of service, such as airplane structural parts, spur and bevel gears, and in some instances worm gears where the bearing characteristics are secondary to strength or resistance to corrosion, or other characteristics that demand that type of alloy. Screwdown nuts have been made from these aluminum bronzes with satisfactory results when the heat treatment was correct. Feed nuts and many other parts are made regularly from these bronzes and they are almost always heat treated to develop the correct hardness and strength to meet requirements with maximum satisfaction.

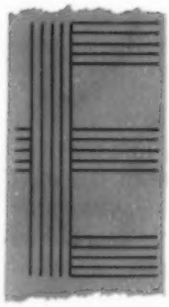
Composition 1*SS* is practically a repetition of 1*PP*, except that the permissible high limit on the aluminum is increased so that certain physical properties may be derived that are peculiar to the alloy when an increase in aluminum is made.

Alloy Shows Strength and Hardness

Composition 1*TT* is a high iron, high aluminum, aluminum bronze, made for many types of service where hardness and high strength are desired as cast. The elongation of that alloy necessarily is low, with such a high percentage of the hardening element, aluminum. That composition is used often in producing bronze dies and some bearings where the bearings mate with hardened steel and the speeds are not high but the need for very strong bronze is imperative.

One of the most noticeable characteristics of aluminum bronze is that of high shrinkage during solidification. Therefore, all castings to be made from those compositions must be pro- (*Please turn to page* 70)

Ford Ring Gears Are Cast Centrifugally



EXPERIMENTAL work of the Ford Motor Co., Dearborn, Mich., on casting gear blanks in centrifugal dies, first announced a year ago, has been wholly successful and centrifugally-cast gears now are in regular production. R. H. McCarroll, Ford metallurgist, under whose supervision the development was conducted, recently stated production of all Ford truck ring gear blanks now was by the centrifugal method. It will be extended to full production of the car ring gear and the transmission cluster gear as quickly as the necessary equipment is completed. Discussion of the development of this method of casting gears is presented on page 30 of THE FOUNDRY for October, 1938.

Greater strength, lighter weight, and faster production are the principal advantages claimed for gears made by the new method. By using sand cores in the die, undercuts can be made which would be impossible in a conventional forging, according to Mr. McCarroll. This saves weight and metal. Still more important is the greater strength of gears made by centrifugal casting. Etched sections show the reason. In some forgings lines of metal flow are parallel to lines of greatest stress. Because of absence of all flow lines in the centrifugal castings, this condition does not exist. The metal is equally strong in all directions.

Simplicity of the centrifugal method is especially noteworthy. Dies, which are made of a special low carbon steel, are mounted on a turntable designed and built by Ford engineers and shown in the accompanying illustration. Eighteen heads are located on the turntable. Each begins to spin as it approaches the pouring ladle, continues to whirl for the 2 minutes required for the metal to solidify, and then stops turning in time for the operator to remove the hot blank and prepare the die for the next casting. An ingenious feature of the casting turntable is that centrifugal force is used to lock the dies in position. This is done by dogs which (*Please turn to page* 82)

Process employs a turntable carrying 18 spinning dies. In a 4-minute cycle, one operator loads the dies, another pours molten steel, and a third removes finished blanks

Renaissance

In this and the August issue, The Foundry publishes the annual exchange paper of the American Foundrymen's association to the Institute of British Foundrymen. The paper was presented at the International Foundry congress held in London, June 12 to 17.

OVER the period of the past two decades, it has not been uncommon in certain circles to hear dire prophecies of the pending extinction of the founding industries. Acute competition has developed in various directions, each of which is a logical and expected happening in a progressive industrial civilization. However, it is becoming obvious that, far from the steel casting becoming an extinct relic of the Dark Ages of engineering industry, such knowledge of its production, and control of its major characteristics are now forthcoming that an increasing scope of application is resulting.

Steel Castings on Up Grade

In the late 1920's, a period of probably the greatest industrial activity the United States of America has experienced, production of steel castings averaged about 1,250,000 tons. Since that time, many developments of a competitive nature have appeared, and, where suited, technically and economically, have taken a certain toll of the production of the industry. In spite of that, the year 1937, not by any means a good year, but one truly described as only an improvement on the two immediately preceding it, saw the production of steel castings almost touch the one million ton mark.

Affected by general stagnation, and accumulated influences of several highly and efficiently advertised competitive products, such a figure indicates beyond question that new applications of steel castings have at least stabilized the position of the industry, and gives reasonable grounds for the belief that a return to normal business conditions will see it attain new heights of production. One of the most powerful influences in that development is believed to be the fact that the industry as a whole is becoming technically strong.

Steel founding frequently has been described as a mixture of art and science. A definition of the two terms possesses no hard and fast dividing line, but assuming one logically could define art as dexterity or skill in performance, acquired by experience, and science as systematized knowledge, then it is believed that progress for the future most surely is based on the encouragement and more complete application of the latter one of the two component factors.

The present paper proposes to offer evidence that this desirable condition is being achieved, and that the results forthcoming are a primary factor in the constantly widening field of application of steel castings in the United States. The incidence of the efforts of the metallurgist on that changing thought in foundry production is remarkable, and a study of the literature of the past 10 years or so impresses one with the conviction that the broader conception of responsibility evinced by the metallurgist is producing a large part of the more systematized methods of attack on fundamental foundry problems.

Within the wider definition of iron and steel metallurgy, there is being built up what might be called a foundry metallurgy devoted to the essential problems of cast-to-shape, unworked materials. Any metallurgical investigation into conditions governing production of sound steel castings runs immediately into the closely related factors of mold and core effects, temperature gradients and their effect upon solidification, localized temperature differences due to design, and many other points which, while not to be defined strictly as metallurgical, exert so profound an influence upon success or failure of the ultimate casting as to compel their being taken fully into account.

Metallurgist Extends Active Interest

It was a logical outcome then, that the metallurgist should extend his active interest, beyond the confines of the metal itself and from this has grown most of the systematic investigation of molding materials and methods of pouring and feeding steel castings. By taking each major operation singly, and correlating the work done in the United States during the past few years, as evidenced by published literature, it will be possible to demonstrate these statements clearly.

Manufacture of suitable steel for castings, in many of the principal features, is quite separate and distinct from steelmaking as practiced by the makers of ingot steel. In the latter case, physical work of a structure-modifying nature reduces the significance of certain conditions, which in the case of the sand casting may mean the difference between success and failure.

It is also of vital significance that the producer of steels destined to be mechanically worked, as by rolling or forging, exerts a complete and unquestioned

of the Steel Casting

By FREDERICK A. MELMOTH
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control over the shape and general design of the ingot form in which his cast metal undergoes solidification. He is able, therefore, to assist sound and progressive solidification to whatever extent he may see fit.

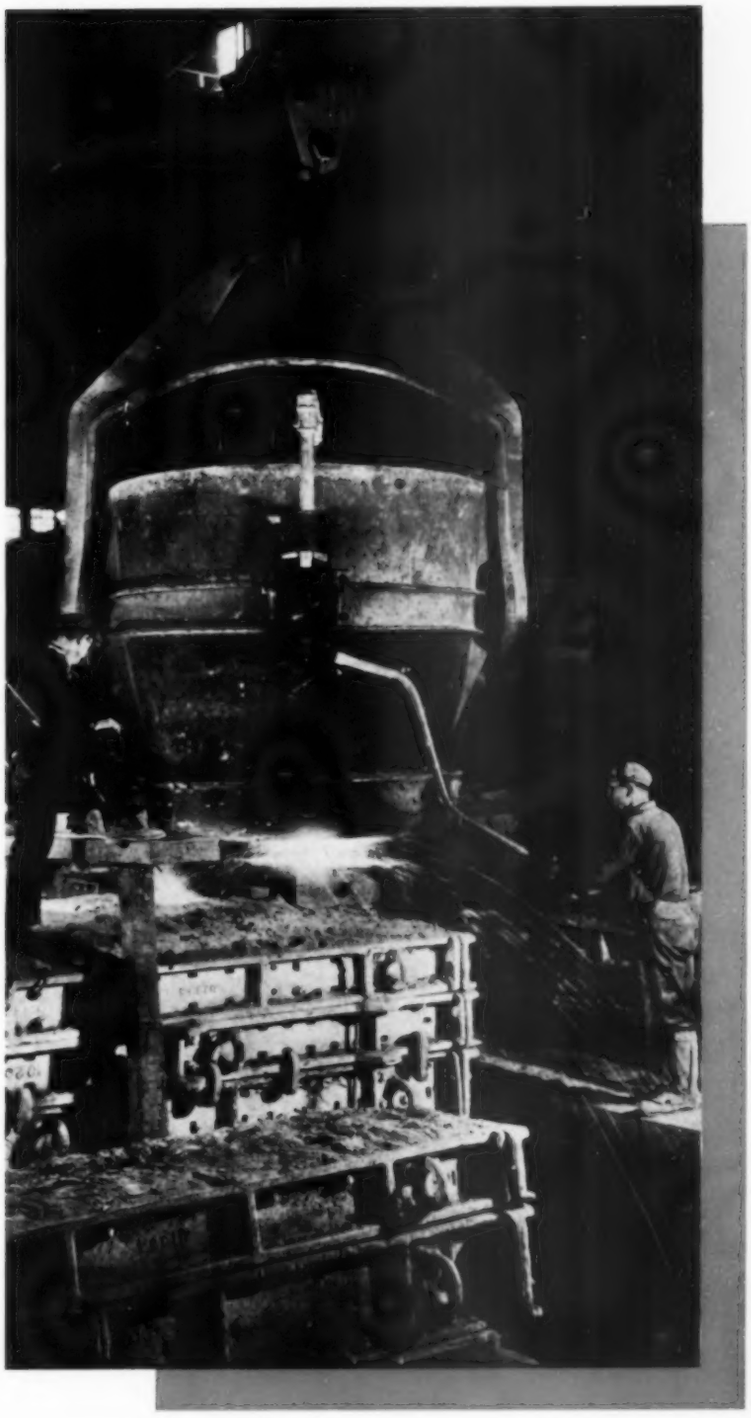
The case of the steel foundryman is vastly different. Faced by a legion of differing shapes, and a multiplicity of sectional thicknesses in the same casting, and a very varying degree of response to his calls for design consideration, his molten steel has perforce to solidify many times in such fashion that no advantage can be taken of orderly and progressive conditions of transformation. In such circumstances, steel must possess, initially, every possible steelmaking inherent quality of soundness, cleanliness and regularity of temperature and composition.

Study Production of Steel

In the last decade the recognition of such severe quality requirements has led to concentrated effort to regularize steel production for castings, and to attempt, at least, to elucidate such steel production problems as could be believed logically to have a bearing on casting behavior. Prominent among American foundry metallurgists who have advanced the knowledge of this subject, one finds such names as Sims, Lillieqvist, Batty, J. Howe Hall, to mention only a few.

Importance of slag constitution and deoxidizing procedure has been investigated in the case of both electric and open-hearth practice. Significance of inclusions, their degree of occurrence and shape, had been considered not only from the viewpoint of their effect on ultimate properties, but also because of the possibly better behavior of clean steel in the mold. In that connection, it is a widely held opinion that basic open-hearth steel is superior to that produced on acid linings in resisting hot-tear formation in castings of intricate and varied designs. There appears no basis for the opinion held at one time that sulphur and phosphorus content explained this diversified behavior, as material control in acid practice, resulting in equally low percentages of both, did not eliminate the disparity.

There would appear to be no question that in cases where steelmaking practice, and particularly methods of deoxidation, were of a type disregarding the degree of occurrence and type of inclusions, there occurred a



greater hot-tearing hazard. Discussion invariably brings out the fact that clean steel, foundry conditions being otherwise equal, suffers much less from that particularly dangerous tendency.

It is from the viewpoint of obtainable physical properties that steelmaking methods have been most rigorously overhauled. In the absence of mechanical work of a structure-affecting type, a steel casting must respond perfectly to heat treatment, if the demands of modern specifications are to be met. Nonmetallic inclusions, unaffected by any type of heat treatment, are without doubt the most effective single factor in limiting the physical properties of steel castings.

Investigate Effect of Aluminum

The work of C. Herty Jr., on conditions governing formation, size and type of such nonmetallics has been of great value to steel foundrymen. Realization also that the major harmful effect of aluminum additions to steel for castings was an outcome of the action of aluminum on nonmetallic inclusions, their shape being changed from a comparatively innocuous globule to a more or less membranous form occurring in the crystal junctions, paved the way for additional work on the correct use of deoxidizers. Comstock, Sims and Lillieqvist largely were responsible for that elucidation of the aluminum problem, which particularly to steel foundries equipped with acid electric furnaces, was of real significance.

Further work by Sims and collaborators throws still more light on the subject, and evolves the suggestion that increased aluminum additions to certain conditions will result in a return to normal ductility. The majority of American steel castings are produced in green sand molds, and use of aluminum in such circumstances is of undoubted assistance in promoting soundness, by inhibiting porosity due to mold gases. Often, however, such castings are made to stringent physical test specifications, and the obtaining of freedom from porosity, at the sacrifice of a large portion of the specified ductility, is of more than dubious value.

Steel Making Exerts Influence

The present situation on that much discussed question of the effect of aluminum in steel for castings is best indicated by saying that many steel foundries in the United States using acid-lined electric furnaces are checking carefully and extensively results obtained by large aluminum additions, up to three or more pounds per ton of liquid steel. So far, reported opinions show a preponderance who claim a decided improvement in ductility, as compared with the normal addition of a half to one pound per ton of steel. There are still producers, however, who fail to experience such benefits, and it seems probable that steelmaking technique has a decided influence on the response obtained.

Development of the electric furnace in steel foundries of the United States has been largely toward acid linings. Indeed, a recent questionnaire addressed to the members of the sixth division of the Steel Founders' Society of America disclosed only one basic lined furnace producing steel for castings in the entire district covering some 30 foundries—many of them large. This calls for some comment, as it is contrary to conditions in Europe.

The frankly held opinion of American steel founders substantiating their preference for acid practice is that while suitable scrap is available, offering adequate sulphur and phosphorus control, such practice has the following advantages: 1. It is speedier, and therefore more economical. 2. Life of the furnace is much longer using standard refractories. 3. Technique of the process is more easily acquired by untutored labor. 4. Steel is much more fluid, and therefore bet- (*Please turn to page* 74)

Table I

Modern American Steels for Castings

Steel	Analysis C.	Mn.	Si.	Mo.	Cr.	Ni.	Va.	Heat Treatment degrees Cent.
1—Mn-Mo	0.28	1.29	0.46	0.30	...	...	...	926 Furnace cool 926 Air cool
2—Mn-Mo	0.28	1.29	0.46	0.30	...	...	...	815 Air cool 650 Air cool
3—Mn-Mo	0.28	1.29	0.46	0.30	...	...	...	926 Air cool 815 Water quench 649 Air cool
4—Mn-Ni	0.23	1.16	0.44	...	...	0.71	....	900 Furnace cool
5—Mn-Ni	0.23	1.16	0.44	...	...	0.71	....	900 Air cool
6—Mn-Ni	0.23	1.16	0.44	...	....	0.71	....	900 Water quench 650 Air cool
7—Ni (2.5%)	0.21	0.64	0.35	....	....	2.55	....	926 Air cool 837 Air cool 593 Air cool
8—5% Cr-Mo	0.18	0.55	0.41	0.48	5.1	....	....	982 Furnace cool 857 Air cool
9—Cr-Va	0.33	0.72	0.41	....	0.93	....	0.19	726 Furnace cool 926 Air cool 837 Air cool 650 Air cool
10—Ni-Mo	0.24	0.64	....	0.33	....	2.15	....	Normalized and tempered
11—Ni-Va	0.33	1.05	....	....	....	1.58	0.10	Oil quenched Tempered 677° Cent.

No.	PHYSICAL PROPERTIES Yield point Tons per sq in.	Ultimate strength Tons per sq. in.	Elongation per cent in 2 in.	Reduction of area Per cent	Charpy impact Ft.-lbs.	HARDNESS Brinell	Shore scler.
1	26.8	40.6	21.5	34.40	19.8	187	27
2	28.9	37.7	28.0	60.58	45.3	179	26
3	37.4	44.6	23.5	57.04	51.4	212	31
4	23.2	36.2	30.5	51.67	....	146	22
5	23.3	39.0	29.5	57.30	....	153	23
6	32.6	41.5	27.0	61.81	....	207	30
7*	24.4	33.8	28.2	52.39	25.0	207	30
8†	28.5	40.4	24.6	60.59	25.6	146	22
9	29.9	42.1	23.0	44.85	....	196	29
10‡	31.2	41.3	24.0	50.00	36.0	...	..
11‡	45.4	51.4	19.5	48.00	....	...	..

*Charpy test at 50 degrees below zero.
†Charpy test at 25 degrees below zero.
‡Paper by F. J. Walls and T. M. Armstrong, Western Metal Congress, 1938.

French Foundrymen Award Medal To Vincent Delport

Vincent Delport
European Manager, The Foundry

THE eighteenth annual convention of the Association Technique de Fonderie was held in Paris, on Saturday, May 20, J. Lobstein, managing director of Fonderies Lobstein, Argenteuil, near Paris, being president. This year the convention was organized within restricted scope, mainly to avoid clashing with the international foundry congress taking place in London 3 weeks later, and the whole proceedings lasted only one day, with the exception of a special lecture given in conjunction with the Societe de Chimie Industrielle on the previous day, Friday, May 19.

Association Presents Several Medals

Between the morning and afternoon sessions, the members gathered at a luncheon held under the chairmanship of the director general of technical education, H. Luc, at which representatives of foreign countries were present. These included J. Leonard, past-president of the Belgian foundry technical association and past-president of the International Committee of Foundry Technical associations, V. C. Faulkner, past-president of the Institute of British Foundrymen, and Vincent Delport, European representative of the American Foundrymen's Association and past-president of the International Committee of Foundry Technical associations.

Following the luncheon the medal awards of the Association Technique de Fonderie were made by the president, J. Lobstein, the medals being handed to the recipients by Director-General Luc. The gold medal of the association for 1939 was awarded to Vincent Delport, European manager of THE FOUNDRY, for his activities in endeavoring to develop and maintain goodwill and relationships between the associations of various countries. The silver medal was awarded to J. M. Espana, vice-president of the association, for the great services he has rendered to the association during his many years of membership, particularly as representative for Spain, and also for the time and effort he has devoted as chairman of the International Dictionary committee, which, under his leadership, has brought out the first issue of the international dictionary of foundry terms recently published in France. A silver medal was also awarded to J. Challansonnet for his many important technical contributions in the field of alloy cast irons, particularly in regard to the more rare metals.

The convention opened Saturday at 10 a.m. in the new building occupied jointly by the Association Technique de Fonderie and the Syndicat General des Fondeurs de France at 66, Rue Boissiere, in the west-end of Paris. The convention was held under the patronage of the French government, and H. Luc, honorary president of the convention, was in the chair at the opening session. The morning technical session was held under the chairmenship of H. Luc, Prof. A. Portevin and Vincent Delport, that session being devoted to papers on foundry training and foundry organization.

Train Apprentices for Various Jobs

The first paper, by Prof. A. Portevin and D. Waeles, dealt with education in connection with the foundry industry and described various means employed in France to train apprentices for various jobs, including the positions of manager and foundry engineer. Particular stress was laid on activities of the Ecole Superieure de Fonderie, of which Professor Portevin is the director and where diplomas of foundry engineer are delivered to students after a course of 3 years. These students are taken from two sources: (a) Practical molders coming from the works and having already a minimum amount of practical experience, but little theoretical knowledge; (b) graduates coming from engineer- (*Please turn to page* 80)

AMONG DETROIT FOUNDRIES

By A. H. ALLEN
Detroit Editor, The Foundry

FOUNDRIES supplying the varied requirements of body, top and fender dies for 1940 models are nearing the end of their normally busy season. Last year the active period on large dies extended through July and then tapered off sharply. This year the first releases were received shortly after the holidays at the turn of the year, and large shops like Detroit Gray Iron Foundry Co. have been working four and five days a week since. By the end of June, however, the programs were nearly completed, except for some cleanup work on dies for Briggs to be used in connection with stampings for the new Chrysler lines.

Sweeping Changes in Store

The three-week delay in the Briggs program, occasioned by labor trouble there, put a serious crimp in preparations for the new Chrysler models, since all new model activity was suspended, as well as current production. Holdups were the natural result in foundries planning to schedule the casting of new dies. When work finally was resumed, intense pressure had to be put on the die program, and patterns were rushed to foundries as fast as they were completed by the Briggs engineering department and patternmakers. This influx of Briggs work the latter part of last month was welcomed with open arms by foundries.

It becomes evident some rather sweeping changes are in store for Plymouth, Dodge, De Soto and Chrysler models next year—more so than is the case with Fisher Body lines for General Motors. Buick, for example, is making practically no changes in body lines, but front ends will be more pointed and completely changed in appearance from this year, and headlamps will be worked into the contour of front fenders. This applies to the regular Buick lines. Two new series, presumably a 50 and a 70 model, went through the tooling stages early in April and embody radical departures from conventional lines. In the case of these models, of course, dies were entirely different from anything previous.

Detroit Gray Iron is probably the largest supplier of body die castings and other castings for use in stamping presses. In the busy season that foundry will cast around 100 tons per day, although the output has run as high as 150 tons per day. Three cupolas are available, one 18-ton unit being operated normally, with a second in reserve and a third smaller one available when the pouring schedule does not call for much tonnage.

Molds for large dies are built in pits in the floor, 6 feet deep. These large castings may weigh up to 35 tons each, and some even heavier have been cast. Iron is tapped from the cupola into 3-ton transfer ladles which are moved about by overhead 10-ton cranes. Several ladles naturally are required for pouring the larger dies, and they are poured simultaneously. Heavy iron weights about 2 feet square in cross section and about 10 feet long, are placed across the top of the mold. These serve to anchor the cope securely. Cooling of these large castings is a slow process if cracks are to be avoided. A 35-ton casting for example, will be left in the mold for about 3 days before it is shaken out for cleaning. The latter is accomplished with sandblast and air chippers.

Will Cast Steel Ball Races

Another step in the Ford program to develop new uses for steel castings produced by the centrifugal process appears to be well through the experimental stage. It is the production of bearing assemblies—balls, inner and outer races. Steel analysis is reported to be comparable to Ford BB steel. Ford engineers refuse to attach much importance to the development, stating there is nothing new to the casting of ball bearings, and the casting of races is a "natural" for the centrifugal process.

It may be some time before such assemblies are used in production. No equipment has been purchased as yet, and the machines used in the experimental work have been assembled from equipment already available in the foundry. To a disinterested observer, the production of cast steel ball (*Please turn to page* 85)

U. S. Has 4776 Foundries

A SURVEY of data tabulated from the recently published 1939-1940 edition of Penton's Foundry List shows the United States has 4776 foundries and Canada has 457, a total of 5233 companies producing castings as compared with 5383 in 1937.

Statistics in the table on this page show the foundry industry in the United States decreased to the extent of 144 foundries during the past two years, and that Canada experienced a loss of six plants. Considering that most of the period since the previous survey has found the industry in general operating at a low rate, the loss in foundries seems extremely light.

Data also indicate some consolidation of foundries and a continuation of the trend toward larger units equipped with machinery for mass production. At the same time, a number of foundries have increased their range of production by adding units to produce castings in more than one of the four main divisions of the industry.

Fourteen states show an increase in the number of foundries. Pennsylvania, with a total of 560 companies, is the leading foundry state, and is followed closely by Ohio with 511, New York is third with 393, Illinois fourth with 369 and Michigan fifth with 313. Chicago still leads among the cities with 153 foundry companies. Cleveland has moved back into second place with 104. Los Angeles is third with 93, New York fourth with 98 and Detroit fifth with 89.

Foundries of the United States and Canada—1939 and 1937

	Total Foundries 1939	Total Foundries 1937	Increase or Decrease in Two years	Gray Iron Foundries 1939	Gray Iron Foundries 1937	Steel Foundries 1939	Steel Foundries 1937	Electric Steel 1939	Electric Steel 1937	Malleable Foundries 1939	Malleable Foundries 1937	Exclusive Nonferrous Foundries 1939	Exclusive Nonferrous Foundries 1937	Nonferrous Foundries Dept. of Other Shops 1939	Nonferrous Foundries Dept. of Other Shops 1937	Aluminum Foundries 1939	Aluminum Foundries 1937	Total Nonferrous Foundries 1939	Total Nonferrous Foundries 1937	Permanent Mold 1939	Permanent Mold 1937	Die Castings 1939	Die Castings 1937	Machine Shop 1939	Pattern Shop 1939	Pattern Shop 1937	Laboratories 1939
Alabama	88	92	—4	78	81	5	4	1	2	2	2	8	8	22	19	15	11	30	27	2	2	..	1	64	65	67	17
Arizona	6	7	—1	6	7	2	2	2	2	..	..	..	..	5	6	3	5	5	6	2	1	..	..	4	6	7	..
Arkansas	19	18	+1	16	16	1	1	1	1	..	..	2	2	10	10	8	8	12	12	..	..	..	..	16	11	11	2
California	274	294	—20	133	142	23	23	20	23	3	3	106	102	71	74	144	143	177	176	9	11	8	9	128	133	134	35
Colorado	45	42	+3	23	25	3	3	2	4	1	..	13	13	7	10	20	21	20	23	1	2	..	..	26	19	18	7
Connecticut	125	122	+3	59	60	6	6	5	3	7	7	56	57	30	32	69	67	86	89	2	2	3	3	81	76	78	34
Delaware	11	11	..	5	5	2	2	1	1	1	1	3	3	3	3	4	4	6	6	..	..	..	..	9	8	8	2
Dist. of Columbia	3	7	—4	3	5	1	1	1	..	..	..	..	2	2	2	2	5	2	4	..	..	..	..	1	..	2	..
Florida	31	25	+6	25	20	1	1	1	1	1	1	6	4	20	18	22	22	26	22	1	1	1	..	20	22	23	3
Georgia	64	64	..	54	59	2	1	2	..	..	..	7	3	33	34	33	31	40	37	1	..	..	..	41	46	45	1
Idaho	7	6	+1	7	6	..	..	..	..	..	..	..	..	7	6	5	5	7	6	..	..	..	..	7	7	3	..
Illinois	369	386	—17	214	227	19	18	12	11	19	21	123	117	76	80	161	157	199	197	18	15	12	13	207	232	256	58
Indiana	199	206	—7	134	133	10	9	7	5	11	10	52	60	47	52	81	84	99	112	5	5	5	4	117	132	134	38
Iowa	76	85	—9	62	64	4	4	2	3	2	2	9	11	29	30	33	38	38	41	1	1	1	1	56	51	120	20
Kansas	52	51	+1	44	42	1	1	1	1	..	..	7	7	28	24	27	24	35	31	3	3	..	..	37	36	35	10
Kentucky	39	41	—2	29	31	..	..	..	..	..	..	8	8	13	14	12	12	21	22	1	1	..	..	23	22	24	2
Louisiana	29	29	..	24	25	5	4	4	3	..	..	3	3	17	16	11	12	20	19	..	..	..	..	20	21	19	2
Maine	28	28	..	26	26	..	..	..	..	..	..	2	2	19	18	15	16	21	20	..	..	..	..	17	20	21	2
Maryland	52	55	—3	37	39	..	..	..	..	1	1	14	15	17	18	21	20	31	33	..	..	..	1	33	29	30	9
Massachusetts	213	210	+3	120	121	8	9	7	7	5	2	83	81	46	43	103	103	124	124	3	3	4	1	102	101	101	31
Michigan	313	324	—11	180	190	21	18	15	15	10	11	106	106	60	74	118	123	166	180	10	11	9	9	184	189	194	86
Minnesota	95	95	..	67	68	4	4	3	3	1	1	20	22	29	26	40	36	49	48	4	5	2	1	63	55	49	10
Mississippi	12	15	—3	11	14	..	..	..	..	..	..	1	1	9	9	4	4	10	10	..	..	..	..	12	6	6	2
Missouri	113	111	+2	69	69	8	8	7	6	2	2	37	35	18	15	47	43	55	50	2	5	1	2	66	77	73	25
Montana	7	8	—1	7	8	..	..	..	..	..	..	..	..	7	7	3	3	7	7	..	2	..	..	7	6	7	1
Nebraska	28	25	+3	20	20	1	1	1	1	..	..	7	4	13	12	18	15	21	16	..	..	..	..	20	20	19	2
Nevada	6	7	—1	6	6	2	2	1	1	1	..	..	1	6	5	4	5	6	6	..	..	..	..	5	6	5	..
New Hampshire	27	28	—1	17	18	2	2	1	1	1	1	9	9	10	11	14	13	19	20	..	..	..	..	15	14	13	3
New Jersey	177	184	—7	93	101	6	5	5	3	4	3	74	73	31	26	85	87	105	99	2	3	5	3	98	93	100	34
New Mexico	1	1	..	1	1	..	..	..	..	..	..	..	..	1	1	1	1	1	1	..	..	..	..	1	1	1	..
New York	393	416	—23	226	240	16	15	12	13	15	15	136	121	103	111	185	182	239	232	8	8	8	8	242	232	242	81
North Carolina	63	62	+1	60	57	..	..	..	..	..	..	3	2	44	40	38	36	47	42	2	1	1	1	40	45	42	1
North Dakota	5	4	+1	4	3	..	..	..	..	..	..	1	1	3	1	2	1	4	2	..	..	..	..	4	4	4	..
Ohio	511	533	—22	290	302	33	31	26	25	19	19	170	190	81	87	221	216	256	277	18	26	9	11	303	302	318	107
Oklahoma	35	38	—3	22	25	1	1	1	1	..	..	11	10	13	12	21	24	24	22	1	1	..	..	23	23	27	3
Oregon	50	44	+6	36	33	4	3	4	3	..	..	10	8	22	19	26	23	32	27	..	..	..	1	26	28	24	3
Pennsylvania	560	591	—31	380	388	61	59	32	28	15	18	132	139	175	177	215	220	307	316	11	12	7	12	396	386	400	137
Rhode Island	33	35	—2	14	16	1	..	..	..	2	1	18	18	6	8	21	21	24	26	..	..	..	..	13	14	15	8
South Carolina	20	20	..	19	19	1	1	..	..	..	..	..	..	15	14	13	11	15	14	..	1	..	..	12	11	12	1
South Dakota	3	3	..	3	3	..	..	..	..	..	..	..	..	2	2	2	2	2	2	..	1	..	..	3	2	3	1
Tennessee	66	72	—6	56	60	3	2	2	1	..	..	10	8	26	26	21	24	36	31	1	1	..	..	47	54	54	13
Texas	96	79	+17	65	60	8	7	6	5	1	..	24	15	37	34	46	37	61	49	2	2	..	..	59	63	58	11
Utah	16	17	—1	14	15	1	1	1	1	..	..	2	2	9	10	8	10	11	12	..	..	..	..	9	9	11	4
Vermont	20	22	—2	16	18	..	..	..	..	..	..	4	4	10	11	8	10	14	15	..	..	..	..	13	14	14	..
Virginia	72	68	+4	69	66	3	3	3	3	..	..	2	2	42	38	37	33	44	40	1	4	..	1	49	40	43	8
Wash ngton	80	86	—6	58	61	12	14	11	13	1	1	18	18	37	38	43	49	55	56	4	2	1	..	32	41	46	12
West Virginia	41	43	—2	29	31	2	2	1	2	1	1	10	9	19	16	19	16	29	25	3	2	2	1	29	30	34	9
Wisconsin	202	208	—6	123	124	15	15	13	13	12	12	63	64	41	49	79	82	104	113	7	6	6	7	126	129	124	53
Wyoming	1	2	—1	..	2	1	..	1	..	..	..	..	..	1	2	1	2	1	2	1	..	..	..	..	..	2	..
Total	4776	4920	—144	3054	3070	299	283	215	205	138	135	1370	1360	1377	1390	2129	2117	2747	2750	126	140	85	90	2996	2941	3076	88
Alberta	13	13	..	11	11	1	2	1	2	..	..	2	2	10	10	12	10	12	12	1	..	..	..	12	11	11	1
British Columbia	41	42	—1	32	35	5	6	5	6	..	1	8	7	26	27	27	28	31	34	2	..	2	..	25	29	30	7
Manitoba	14	15	—1	8	8	2	3	2	2	..	..	5	5	2	1	7	7	7	6	1	1	..	..	9	8	9	5
New Brunswick	10	11	—1	9	10	..	..	..	..	..	..	1	1	8	8	7	4	9	9	..	..	..	..	8	7	8	..
Newfoundland	3	3	..	3	3	1	1	1	1	..	..	..	..	3	3	3	3	3	3	..	..	..	..	3	3	3	2
Nova Scotia	22	18	+4	19	16	2	2	2	1	..	..	1	1	15	15	8	6	16	14	..	1	..	..	15	17	14	..
Ontario	260	264	—4	191	202	8	5	5	4	10	10	56	49	98	97	125	157	151	146	7	4	8	6	195	169	161	31
Prince Edward Island	3	3	..	3	3	..	..	..	..	..	..	..	..	2	3	2	1	2	3	..	..	..	..	3	1	1	..
Quebec	86	89	—3	59	63	9	9	8	7	1	1	19	16	41	39	56	52	59	55	..	6	..	1	64	61	65	26
Saskatchewan	5	5	..	5	5	..	..	..	..	..	..	..	..	5	5	4	4	5	5	..	..	..	..	4	4	5	..
Total	457	463	—6	340	356	28	28	24	23	11	12	92	81	209	206	251	272	301	287	11	12	10	7	338	310	307	81
Total in U. S. and Canada	5233	5383	—150	3394	3426	327	310	239	228	149	147	1462	1441	1586	1596	2380	2389	3048	3037	137	152	95	97	3244	3251	3383	969

QUESTIONS AND ANSWERS

Wants a Suitable Composition For Light Cylinder Liners

We are considering the substitution of iron alloyed with nickel and chromium for our plain cast iron light cylinder liners. Is there any difference in contraction and expansion of semisteel and plain cast iron? What is the best metal for light liners?

Expansion and contraction of gray cast iron varies to some slight extent depending on the composition, but the iron of any given analysis will contract and expand uniformly irrespective of whether steel forms a component part of the charge. Steel loses its identity in the melting process. In a paper presented by W. Paul Eddy a few years ago before the American Foundrymen's association, metal of the following composition was claimed to show superior properties in heat treated gray iron cylinder liners: Total carbon 3.10-3.40 per cent cent; combined carbon 0.75-0.90 per cent; manganese 0.55-0.75 per cent; phosphorus maximum 0.20 per cent; sulphur maximum 0.10 per cent; silicon 1.90-2.10 per cent; chromium 0.55-0.75 per cent; nickel 1.90-2.20 per cent.

Gives Information on Melting Steel by Crucible Process

We will appreciate information on melting steel in a crucible type of pots, furnaces, etc., required for melting steel in small amounts.

Puddled iron or open hearth steel scrap low in carbon is melted in clay crucibles or in clay lined graphite crucibles. A sufficient amount of washed metal, iron containing about 3 per cent carbon, or alternatively a sufficient amount of charcoal is added to produce steel of the desired carbon content. The pot contains about 100 pounds and the metal is melted in various types of furnaces fired with anthracite coal, coke, gas or oil. The pot with a luted cover protects the metal from oxidation. The process merely is a melting process and the production of steel of the desired analysis is predicated on the analysis of the material in the pot.

The foregoing briefly covers your inquiry, but as in the case of many other processes the actual production of steel in a crucible involves a background of metallurgical knowledge and skill gained through experience. The fact that steel may be melted in a crucible does not mean that an ordinary brass melting furnace can be utilized. Temperature attained in one of these furnaces is not high enough to melt steel. Either an extra high stack or forced draft is required where coal or coke is employed for fuel. With gas or oil a special type of burner is required to develop a temperature of 3100 or 3200 degrees Fahr. in the molten metal. For a proper description of every phase of crucible steel melting we suggest a study of that subject in *The Steel Foundry* by John Howe Hall.

Mold Must Be Vented To Make Smooth Surfaced Casting

We are enclosing a blueprint for a cast steel anode mold approximately 5 feet square over all, but as you will note, the casting is made in two sections, each approximately 5 feet in length by 2½ feet wide. The plain flat body of the casting is 3⅛-inches thick with a flange 1-inch thick and 2¾-inches deep projecting all around the perimeter. Weight of one half casting is 1160 pounds, while the weight of the other half is 1428 pounds. The face of these castings must be perfectly smooth and clean. We shall appreciate your advice on proper facing mixture, type of gates and risers and any other items necessary to secure clean, smooth, solid castings.

Type of gate and risers to use on these castings is not a feature of major importance. So long as the gate is of ample proportion to admit the metal rapidly, it may be placed at almost any point on the rim, preferably at the center of the plain side, that is the side where the joint is machined to join the other half of the casting. Object of pouring rapidly is to keep the metal in motion over the face of the mold and thus prevent the formation of cold shut streaks, bands and small pockets. Three sinkheads, one near each end and one in the center, approximately 10 inches in diameter and 12 inches high will feed the casting satisfactorily.

The greater part of the pattern may be covered with ordinary facing sand, say half and half new and old silica sand. The hazardous section of the

mold, the part that is responsible for pits, blowholes and scabs, is the raised, triangular body of sand between the face of the mold and the flange. Metal on top and along one side of this body of sand generates an extra volume of gas. If this gas cannot escape readily through the sand, a certain amount will enter the metal.

In the passage through the face of the mold into the metal this gas under pressure will disrupt the sand to a greater or lesser extent and this disrupted condition will be reflected on the surface of the casting. While solidifying, the metal contracts and hugs the sand corner tightly, thus imposing another feature, tendency to fusion under heat and pressure, which the sand must resist.

Facing sand for this hazardous area is made up of all new sand lightly bonded with clay and cereal binder and carrying approximately 50 per cent silica flour. To realize the full value of this facing it is necessary to vent the corner to what might be regarded as an extravagant extent. A quantity of coke or cinders might be employed for the purpose, but this material contaminates the sand for subsequent use. A suggested and more workmanlike method is to bed a piece of 1-inch pipe in the sand about an inch away from the pattern and flange corner along the side and both ends. The pipe is freely perforated and the open ends are connected to suitable opening leading either to the bottom or top of the drag part of the mold.

Bonnet on Top of Cupola Stack Needs Frequent Renewal

The top of our cupola stack is surmounted by a steel bonnet which has to be replaced frequently. Can we use asbestos or some other material to make the stack last longer?

From the wording of your letter we cannot decide definitely whether you refer to the top of the stack or to the bonnet, or to both. If the brick lining is carried to the top of the stack, as in usual practice, the top edge of the stack should not be affected by the heat to any great extent and therefore should last almost indefinitely. Assuming that you refer only to the bonnet or hood, it is possible that it is too light, or that it is located too close to the stack. A hood mounted about 12 inches above the stack will function just as satisfactorily as one mounted closer to the top. Cold air drawn in through the opening will neutralize to a considerable extent the intensity of the flame. A possibility also exists that you use a full blast up to the conclusion of the heat when the cupola is almost empty and therefore an intense flame shoots through the top of the stack.

For several reasons not necessary to touch upon at present, the blast should be reduced toward the conclusion of the heat and in many instances can be shut off altogether before the final iron is tapped. You have two alternative solutions for the present problem. One is to erect a hood of heavy plate, say ½-inch thick. The other is to erect a cast iron hood ½ or ¾-inch thick. Either one should last for several years. For a permanent hood that probably will outlive the cupola, the hood may be provided with a narrow flange around the inside lower edge and lined with fire brick. Obviously the standards supporting the hood also must be strong and substantial.

Iron Plates Cover the Gangway Floor in Many Foundries

We are planning to put down a new gangway in our foundry. Can you tell us what type of gangway is favored in the modern foundry.

Without a full knowledge of all local conditions it is impossible to state definitely that any one type of material is superior to others for gangway construction. Many factors must be taken into consideration, first cost, upkeep, material on hand, truck weight and frequency of operation, method of handling iron and hot castings. Usual materials for gangway construction include wood blocks, brick, concrete, reinforced concrete, and iron plates. Under certain conditions each of these material presents certain advantages and disadvantages. The modern trend seems to favor iron plates or reinforced concrete. Triangular cast iron plates approximately 12 inches in length, 1-inch metal thickness, flanged on the bottom and provided with shallow knobs on the top of prevent skidding and promote traction, are laid on a substantial concrete base.

Description of these plates as applied to road construction was presented in the September, 1934 issue of THE FOUNDRY. In the reinforced concrete gangway, sections of cast iron grating are bedded in the concrete flush with the top surface. It is claimed that this type of construction is comparatively cheap. The gratings can be made in the foundry. The floor is easy to install and is highly resistant to traffic. The gratings may be cast to any desired size or shape. In a prominent midwest foundry the section is 18 x 30 inches, ¾-inch thick with 1-inch openings separated by ½-inch strips. Each casting weighs 47 pounds.

Molding Sand Which Is Too Wet Ruins Two Monel Castings

We are forwarding two 6-inch monel pipe flanges connected by a single gate, as they came from the mold. We shall appreciate your opinion on the cause of the rough, porous condition of the surface on both the cope and drag sides.

The castings were poured in sand that was too wet. Monel metal, like steel, is extremely sensitive to moisture and must be poured either into dry sand molds, or into green sand molds where the sand is as dry as it can be worked. In this particular instance due to the large flat face on the castings, provision should be made between the lower edge of the drag and the bottom board for the rapid escape of steam generated when the metal enters the mold.

Correct Bed Height In 32-inch Cupola

We have a cupola 32 inches diameter with six 6½-inch diameter tuyeres. What is the proper blast pressure for a cupola this size and how is it measured. Is there any way of obtaining this pressure without a gage. What is the correct height for the coke bed. What is a suitable mixture for a mold for a silver smelter. The wall of the mold is 1⅛-inches thick. At present we use a mixture of 75 per cent machinery scrap and 25 per cent pig iron.

Taking the questions in the order presented the air pressure in a 32-inch cupola should run from 8 to 10 ounces. Some form of gage must be used to measure the pressure. By varying your blast pressure from time to time you can determine by the behavior of the cupola whether it is working satisfactorily or not.

The ordinary height of the bed in a 32-inch cupola is about 30 inches above the tuyeres. This means 30 inches after it has burned through and settled down. However, the height depends on the kind of coke. You will require a less amount of first class, high carbon foundry coke, than you will with a lower grade fuel.

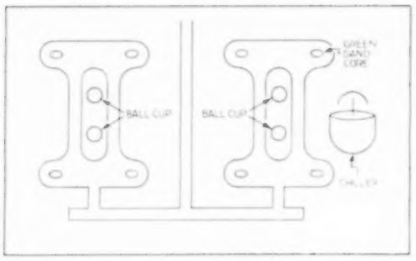
Your mixture of 75 per cent scrap and 25 per cent pig does not convey any information since you do not give the analysis of the pig. We assume that the scrap is machinery scrap with a silicon content of approximately 2.25 per cent. If you are using No. 1 or No. 2 foundry pig, your present mixture is fairly satisfactory for a mold for a silver smelter. The mold will show longer life from a mixture containing bessemer pig iron.

Chilled Portion Is Much Too Deep

We are making some cast iron bearing castings containing semispherical indentations which are chilled. We are having trouble with breakage across that section. Plates are cast on edge and gated from the bottom so that the iron runs up over the chillers leaving a smooth surface. The mixture contains 25 per cent steel scrap, 10 per cent sprues, and 65 per cent foreign scrap, mostly engine blocks. Total charge is 1000 pounds. Metal is melted in a 42-inch cupola. We are sending you one of the plates for examination. The depth of chill is about that desired, but it can be about ⅛-inch less.

Examination of the bearing casting which you forwarded to us leads to the opinion you are obtaining too great a chill for thickness of metal involved. Measurement of the casting shows that general overall thickness is ⅞-inch except at the top of semispherical indentation where the metal is about ½-inch thick. Actual chill as nearly as we can measure is about ½-inch in depth, and therefore at the semispherical portion apparently extends completely through the casting.

Incidentally, the casting you submitted is not perfectly flat on the back, and when it is bolted into place, additional strain will be placed on the piece which already contains some strain resulting from partial chilling. Possibly that may



Sketch showing method of gating

be the reason for the castings cracking, but we believe that the chill is too deep. In our opinion the chill should not be over ¼-inch deep. If it must be about ½-inch, the thickness of the casting will have to be increased to prevent trouble. Depth of chill may be reduced by decreasing the size of the chill, or changing the composition to provide a softer mixture.

Gives Composition For Glass Molds

Can you give us any information on suitable compositions for castings which are employed for glass molding? What progress has been made in obtaining castings which will not crack readily from the heat of glass?

In recent years considerable progress has been made in the development of numerous alloy irons which are claimed to give good account of themselves in the glass industry. They include straight nickel, nickel-chromium, nickel-chromium-copper, molybdenum, and nickel-chromium-aluminum-vanadium alloy iron. One contains approximately 1.50 per cent silicon, 0.60 per cent manganese, 1.50 per cent nickel, 0.60 per cent chromium and 3.30 per cent total carbon.

Another contains 1.60 to 2.80 per cent silicon, 1.50 to 2.00 nickel and 2.80 to 3.00 per cent total carbon. A third alloy iron includes 14 per cent nickel, 2 per cent chromium and 7 per cent copper in addition to the usual amounts of silicon, etc., found in gray cast iron. A fourth contains about 3.35 per cent silicon, 0.25 per cent manganese, 2 per cent chromium, 0.75 per cent nickel, 2 per cent aluminum, and 0.25 vanadium.

To Melt Iron Hot In Small Cupola

We have a small cupola lined to 25 inches, with six tuyeres 12 inches above the sandbed. We have tried different depths of bed and different amounts of coke, but cannot secure hot iron. Can you advise us if and how scrap from stone crusher frames containing steel in rather large amount can be melted in this cupola. We make some castings in which any kind of scrap can be used if it can be poured. Castings range in weight from 1 to 350 pounds with the majority between 35 and 75 pounds.

The data submitted in your inquiry is not sufficient on which to base an opinion. You do not state the area of the tuyeres or blast pipe, volume of air delivered by the blower, weight of each iron charge, weight of coke between charges, height of coke bed, etc. All these factors bear a definite relationship to each other and in addition they must synchronize to secure maximum operating efficiency from the cupola. Dull iron may result from any one or a combination of several causes. The most prolific cause is an insufficient amount of coke on the bed and between the charges.

In this particular case the trouble may be accentuated by charging thick, heavy pieces of scrap. Instead of guessing at the probable cause of the present unsatisfactory performance we suggest the following brief outline of procedure: Sand on the bottom should not contain any more moisture, and should not be rammed any harder than sand in a green sand mold. A wet or hard bottom will cause the iron to boil and lose temperature. Before the fire is lighted dump enough coke in the cupola to bring the top about 3 feet above the tuyeres.

After this has burned through and settled down add enough coke to bring the top about 40 inches above the tuyeres. Charge 500 pounds of iron followed by 75 pounds of coke and repeat until the entire amount for the day's heat has been charged. If the heat runs over an hour add 20 pounds of limestone to each charge. The tuyeres should have a combined area of approximately 100 square inches and the blower should be capable of delivering about 1000 cubic feet of air per minute at a pressure of 6 to 8 ounces. The crusher scrap will melt readily, but on account of the low silicon content will freeze rapidly and will be extremely hard when poured into thin castings.

Place Abrasive on Casting Face

We have an order for some abrasive faced threshold castings, and will appreciate any information on their production. We have made a few without much success. Our procedure has been to sprinkle the drag (we have tried the cope too), with molasses water after having placed the abrasives grains over the face and then baking the mold until the abrasive is securely fastened.

It is our understanding that production of abrasive faced nonferrous or ferrous castings requires some skill and experience to overcome the difficulties which prevent a perfect job. We believe that the first step in the procedure is to spray the face of the mold with molasses water to provide a sticky surface which will hold the abrasive grains in place. The abrasive is put in place in a very thin layer by using a sieve or screen of the proper mesh for the particular size of abrasive used.

Then the abrasive is sprayed again with molasses water, and the face skin dried to be sure that the moisture is driven back far enough to prevent trouble from that source. We also understand that use of a little fire clay in addition to the molasses water aids greatly in holding the abrasive in place. As we recall it, the fireclay is used dry, and only a very small amount is used, just enough to give a very thin coat.

Permanent Mold May Not Be Successful

We are pouring magnet material containing cobalt, nickel and various other ingredients at a temperature of 3100 degrees in baked sand molds. We are interested in developing a permanent mold set up for that job, and we would like to know if you have any information on material for molds which will operate at that temperature.

With the high pouring temperature involved, it is doubtful whether you can find a permanent mold material which will last as long as those employed in production of certain types of gray iron and nonferrous castings. However, there are a number of alloy steels and irons which might prove satisfactory for your purpose. One of them, for example, is that employed by the Ford Motor Co., for the production of centrifugal steel castings. The mold material is steel which contains about 0.20 per cent carbon, 0.50 per cent chromium, and 1.50 per cent molybdenum.

Another possibility is an alloy iron containing 4.5 per cent nickel and 1.5 per cent chromium which in 2-inch section should contain about 0.8 per cent silicon and 3.0 per cent total carbon. That material when cast in sand molds has a white fracture, and of course would have to be cast to shape since any finishing would have to be done by grinding. The alloy can be toughened to a considerable degree by heating to 1600 to 1650 degrees Fahr. holding one hour for each inch of section thickness and cooling in the furnace. Another composition that might serve contains 2.65 per cent silicon, 0.70 per cent chromium, 0.60 per cent molybdenum, and 3.30 per cent carbon.

A fourth composition contains 2.20 per cent silicon, 1.50 per cent copper, 0.10 per cent vanadium, and 3.30 per cent carbon. Another composition quite similar to that previously given substitutes 0.50 per cent chromium for the 1.50 per cent copper. In using permanent molds, it may be well worth while looking into the question of mold coatings for protecting the surface. The coatings should be extremely thin, and may be comprised of an extremely refractory fire clay suspended in a very dilute solution of water glass (sodium silicate). The sodium silicate aids in keeping the clay in suspension.

Expansion of Sand Causes Buckle

Can you tell us what makes sand buckle when aluminum is poured in the mold, especially on the inside of a rounding corner or sometimes on a flat surface on the sides of a straight draw casting? We know it is caused by the expansion of the sand when the hot metal is poured against it, but are wondering if it is caused by something in the sand.

As you mentioned in your inquiry, the grains of silica sand expand when heated, and that expansion will cause the sand to buckle unless there is enough other material in the sand which has sufficient contraction to take care of the expansion. Clay bond contracts when heated to elevated temperature, and therefore is the material usually employed to counteract the effect of expansion in the silica grains since some of it already is present in the sand. However, it is possible that your sand already is high in clay content, and if more were added, it might reduce the permeability to such a point as to cause trouble from blows, and therefore, it may be necessary to use other means to accomplish the same results. Addition of cereal binders, wood flour, and other combustible materials can be made since they burn out at fairly low temperature leaving voids into which the expanded sand drains may move and thereby cancel or reduce the expansion.

Brass Casting Has Split in Center

We are forwarding a section of a brass casting which is part of a blade about 30-inches long made in the 85-5-5-5 alloy. The charge is made of 40 per cent returns which is melted first and covered with charcoal. Copper is then melted, then the tin and lead. About 20 minutes before pouring, zinc is added with 4 ounces of 15 per cent phosphor copper to the 125-pound charge. The brass is poured at about 2200 degrees Fahr., and five flasks are poured to a charge. When this trouble is found it does not exist throughout the entire heat, only one or two pieces showing the trouble. In many cases the split will show an orange band around it, more so than on the enclosed sample. The metal is melted in silicon carbide crucible in an oil fired furnace. Melting the 125-pound charge takes 1¼ to 1½ hours.

Careful study of the section of the casting sent to us which is about ⅛-inch thick and 1½ inches wide with a split or opening through the center, leads us to the opinion that the difficulty results from gases being absorbed in the metal during melting. Breaking the piece open so that both surfaces of the split could be examined under an ordinary magnifying glass reveals clearly a dendritic type of structure containing numerous fine passages. That indicates to us the presence of gases. Ordinarily with a thin casting, trouble from gases is not quite so pronounced as the metal generally freezes so rapidly as to hold them in suspension.

In this case however, the conditions were such that the center remained molten long enough to permit concentration of the gases in the middle. While you mention that you only have this difficulty in one or two pieces in a heat, we believe that examination of the fracture under a strong magnifying glass or microscope would show a porous structure in the centers.

Your trouble can be eliminated by careful attention to the melting practice. You state that it takes from 1¼ to 1½ hours to melt the 125-pound charges, and that seems extraordinarily long to us even though a cold furnace is used. We believe that it can be melted in much less than 1 hour. Therefore, check the oil and air control valves and see that you are obtaining sufficient combustion. Cut down on the amount of oil so that you are obtaining a sharp flame.

MEN of INDUSTRY

CHARLES J. MILLER, president, Fremont Foundry Co., Fremont, O., was made president of the Gray Iron Founders' society at the meeting of the board of directors following the annual meeting of the society in Cincinnati on May 15. Mr. Miller has been connected with the foundry industry for many years. From 1901 to 1906 he was with the Ferro Machine & Foundry Co., Cleveland and for the next 14 years was connected with the Henry Furnace & Foundry Co., Medina, O. That company also maintained a plant at Chagrin Falls, O. Mr. Miller left Medina in 1920 to organize the Fremont Foundry Co. which he has operated since that time. He has been active in the work of the Gray Iron Founders' society and is a member of the American Foundrymen's association.

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D. J. MACDONALD, vice president, Dominion Radiator & Boiler Co., Ltd., Toronto, Ont., recently has been elected president of the Ontario Chapter of the A. F. A. Mr. Macdonald is a Canadian, born in Coburg, and after receiving high school training joined the American Radiator Co., Buffalo in 1907. Later he was transferred to the Canadian branch of that company, the American Radiator Co. of Canada Ltd., Brantford, Ont. With the exception of a year spent in the Buffalo plant and 3 years in the army, Mr. Macdonald's experience has been with the one company, in which he has progressed steadily to the position of vice president. In 1923 the American Radiator Co. of Canada Ltd., bought the Dominion Radiator Co. and the firm's name was changed to the Dominion Radiator & Boiler Co., Ltd. Before he left for France, Mr. Macdonald held the position of treasurer and on his return was promoted to assistant manager, then manager and finally to vice president.

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FRED C. NUS, foundry production superintendent, John Deere Tractor Co., Waterloo, Iowa, recently was elected president of the Northern Iowa Foundrymen's association. Mr. Nus was born Feb. 13, 1891 in Fayette county, Iowa, and moved to Waterloo in 1909 to attend business college. He worked in Waterloo and DesMoines Iowa, during 1910 and 1911 as bookkeeper and shipping clerk and gained practical experience in machine shop during 1912 and 1913. From that time until 1918 Mr. Nus worked for Cement Tile Machinery Co., Waterloo as shipping clerk, foreman and general superintendent in charge of the foundry and machine shop. In 1918 he became connected with John Deere Tractor Co., as employment manager, also being in charge of timekeeping, welfare and safety. In 1927 he was transferred to the foundry department in charge of production materials and office.

* * *

J. H. JOHNSTON, assistant superintendent, Foundry and Micarta division, Westinghouse Electric & Mfg. Co., Pittsburgh, recently was elected president of the Pittsburgh Foundrymen's association. Mr. Johnston entered the employ of the Westinghouse company in 1920 and in 1922 was transferred to the Cleveland works as metallurgist. He was appointed general foreman in 1926 and foundry superintendent in 1930. In 1933 he was transferred to Pittsburgh as manufacturing engineer, and later was appointed assistant superintendent.

* * *

L. C. RICKETTS, formerly general superintendent of the Harrison works of the Worthington Pump & Machinery Corp., Harrison, N. J., recently was appointed manager of

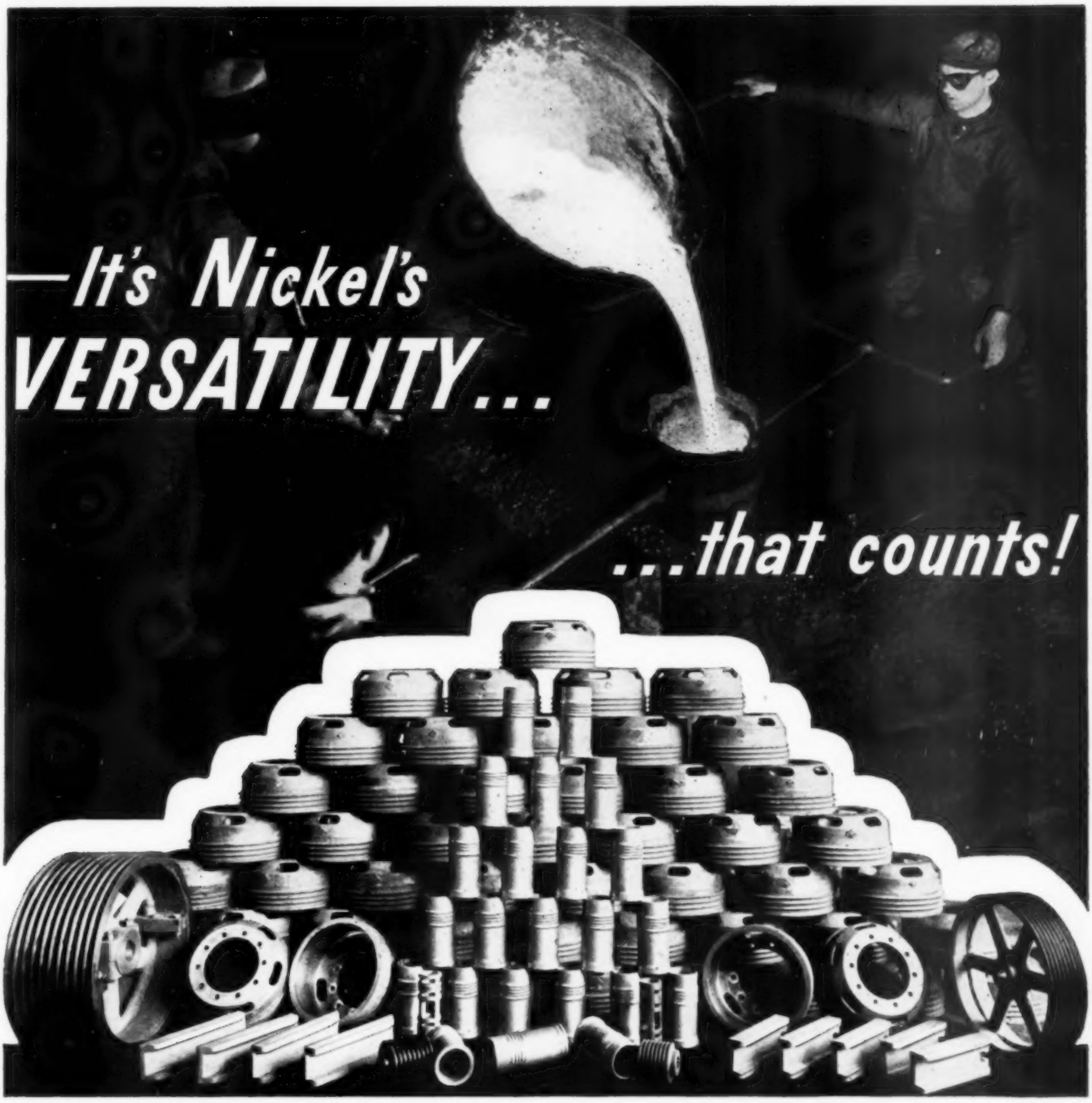
(*Continued on page* 36)

D. J. MacDonald

Charles J. Miller

J. H. Johnston

Fred C. Nus



Heat after heat, day in and day out, quality metal comes down the spout—thanks to Nickel, the versatile alloying element. Grey iron castings correctly alloyed with Nickel keep profits from leaking out of the foundry via the scrap pile route where many castings lacking in the desired mechanical properties, density or machinability find their sad ending.

Nickel minimizes porosity and shrinkage, guards against chilled edges and imparts greater strength and toughness. This versatile alloy will give you maximum machinable hardness, will build up resistance to wear, corrosion and heat. Sound castings with uniform structures for applications requiring pressure tightness are profitable castings to make and you can protect these profits by using Nickel's help in rendering a close-grained, dense material.

The assistance of our nearest distributor is available to you—call on their foundry specialist regarding your tough jobs. They, as well as ourselves, will gladly consult with you on any questions concerning the use of Nickel in cast iron, steel or non-ferrous castings.

Pictured above are uniformly sound castings from the plant of the Hesse-Ersted Iron Works, Portland, Ore. Every casting contains Nickel. Brake drums, to withstand wear and heat-checking, contain 1.50% Nickel and 0.50% chromium. Using a 30% steel charge, these drums have a Brinell value of around 260. The Diesel cylinder sleeves are of similar composition but with the steel charge modified. The sheaves are made with a 25% steel charge and contain 0.75-1.00% Nickel. The locomotive shoes and wedges contain 0.50% chromium and 2.00-2.50% Nickel.

NICKEL CAST IRONS

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

(*Continued from page* 34)

that works. Mr. Ricketts has been with the Worthington organization for the past 10 years. W. D. SIZER, who joined the company in 1920 has been appointed executive engineer in charge of all engineering activities at Harrison. B. R. MCBATH has been made engineer in charge of the centrifugal engineering division, succeeding Mr. Sizer. J. H. BRAUTIGAM succeeds W. H. SCHERER as manager of the company's Holyoke works. Mr. Scherer will devote his entire time to further development of manufacturing methods in all of the company's plants, as assistant to H. C. Ramsey, vice president in charge of operations, with headquarters at Harrison.

* * *

C. E. WESTOVER, superintendent, Burnside Steel Foundry Co., Chicago, recently was elected chairman of the Chicago Chapter of the A. F. A. Mr. Westover graduated from the University of Nebraska in 1908 and took a post-graduate course in engineering until 1911. From boyhood he had worked in his father's foundry at Lincoln and after finishing his college work, started in the foundry business. Mr. Westover operated his own iron foundry in Nebraska until 1923 when he became connected with the Omaha Steel Works, Omaha, Nebr., as superintendent. Later he was plant manager, American Manganese Steel Co., Denver; superintendent, Otis Elevator company's steel foundry at Buffalo; and for almost 5 years was superinendent of the Farrell-Cheek Steel Foundry Co., Sandusky, O.

* * *

CLAYTON A. FARMER, recently has been made foundry superintendent, Acme Foundry Corp., Cleveland. Mr. Farmer is a native of southeastern Pennsylvania and served his apprenticeship with the A. Buch's Son's Mfg. Co., Elizabethtown, Pa. He began his experience as a foundry executive with that company after specializing in cupola practice and the construction and demonstration of molding machines. Later he was connected in a supervisory capacity for varying periods with Clark Bros., Olean, N. Y.; E. C. Stearns Co., Syracuse, N. Y.; Dobbie Foundry Co., Niagara Falls, N. Y.; and the Green Fuel Economizer Co., Beacon, N. Y.

* * *

WILLIAM E. BUCKLER, formerly superintendent, John Deere Harvester Co., East Moline, Ill., for the past 11 years, has been appointed superintendent of the tractor foundry of the Allis-Chalmers Mfg. Co., West Allis, Wis. Mr. Buckler is a graduate mechanical engineer, receiving his education at the University of Alabama and Alabama Polytechnic institute. He received his early training and experience with the Central Foundry Co., Holt, Ala. and the U. S. Steel Corp.'s foundry Fairfield, Ala. He also has been dynamometer engineer for the Stewart-Warner Co., Chicago. Mr. Buckler has been a professional football player as well, being a member of the champion Chicago Bears team of 1932-33.

* * *

HORACE A. DEANE, Deere & Co., Moline, Ill., recently was elected chairman of the Quad-City chapter of the A. F. A. Mr. Deane was graduated from the University of Illinois, Urbana, Ill., and has been connected with Deere & Co. since 1920. He worked as chemist on iron, steel, nonferrous, and miscellaneous materials, and also as general metallurgist in the heat treatment of steel, etc. For the past few years he has devoted most of his time to foundry problems including not only metallurgical processes, but also general methods and cost. Mr. Deane has been active in the work of the Quad-City chapter and has occupied all offices of that group. He has presented a number of papers before the national convention of the association and has talked before various chapters. He is a member of a number of A. F. A. committees including that on papers and program.

* * *

N. A. FELDMAN has been appointed office manager and purchasing agent, Claude S. Gordon Co. of Ohio, 1988 East Sixty-sixth street, Cleveland.

* * *

HARRY V. MERCER, advertising manager, American Rolling Mill Co., Middletown, O., recently was elected vice president of the Porcelain Enamel institute.

* * *

W. J. WESTPHALEN, president and general manager, Laclede-Christy Clay Products Co., St. Louis, recently was re-elected president of the American Refractories institute.

* * *

A. H. KING has been appointed representative of the Wheeling Steel Corp., Cincinnati, and will make his headquarters at 2324 West Main street, Kalamazoo, Mich.

* * *

R. E. S. GEARE recently was made general sales manager, T. B. Wood's Sons Co., Chambersburg, Pa. Mr. Geare formerly was vice president in charge of sales and engineering of the L. H. Gilmer Co., Philadelphia.

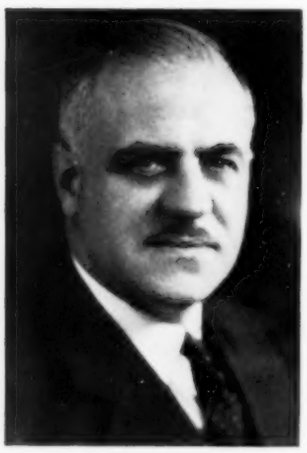
* * *

OLIVER SMALLEY, British consul at Pittsburgh, and president, Meehanite Research Institute of America, Inc., Pittsburgh recently was honored by receiving the Order of the British Empire.

* * *

JAMES KOFRON recently was appointed foundry superintendent, Glauber Brass Mfg. Co., Kinsman, O. Mr. Kofron has been connected with the foundry industry for 30 years starting with the Standard Brass Co., Griffin, O., in 1909. Four years later, as superintendent of

(*Concluded on page* 38)

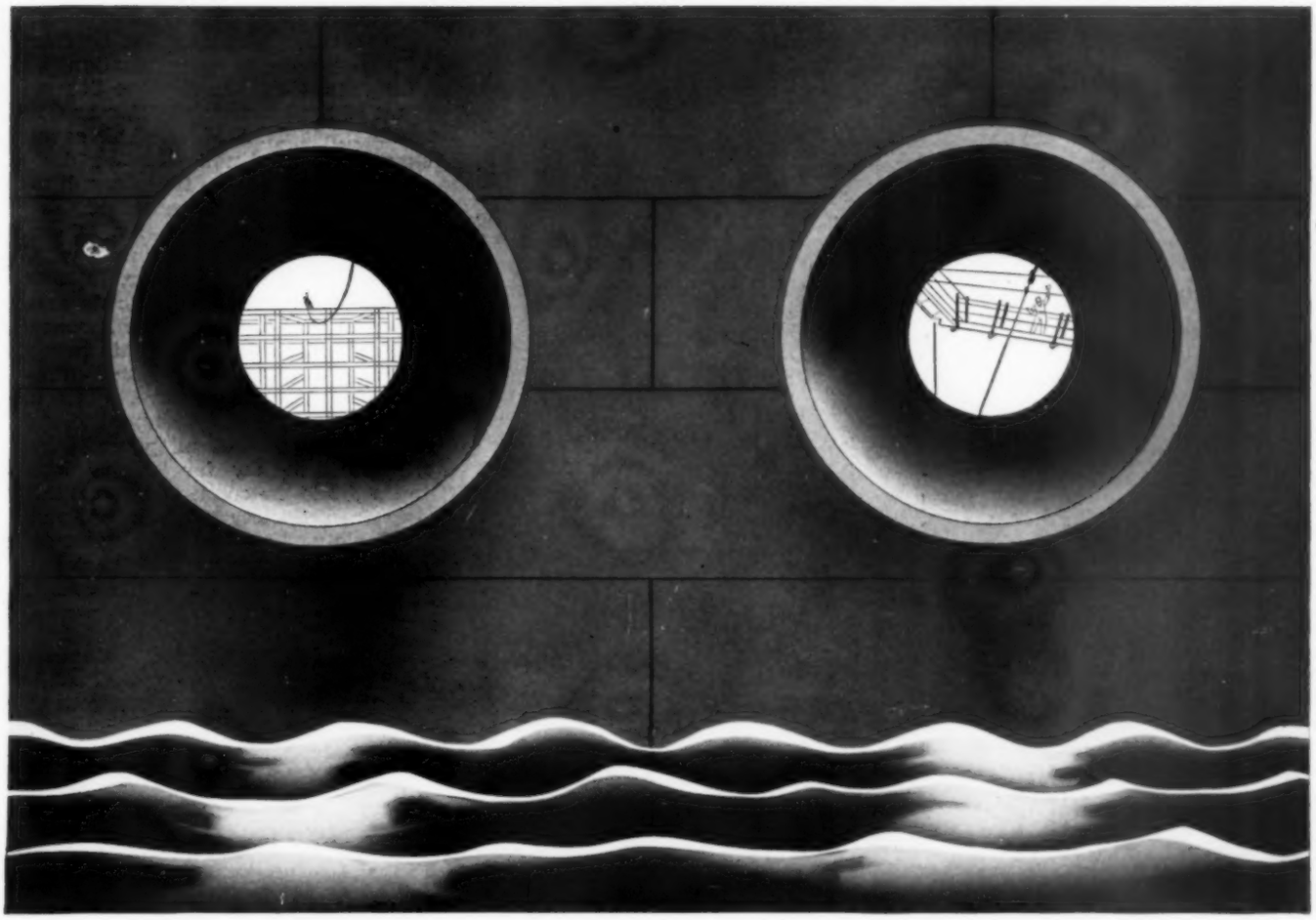


C. E. Westover

Clayton A. Farmer

W. E. Buckler

Horace A. Deane



A CAST IRON THAT CUTS COSTS

Especially tough service requirements need not call for expensive alloy combinations. Often a less costly, but judiciously chosen, material will do the work.

Such was the case with castings for reservoir discharge nozzles and lock-gate valves. Physical specifications called for 55,000—65,000 p.s.i. tensile strength, 5,300—6000 lb. transverse strength (12" centers), 220-240 Brinell hardness.

All this plus the ability to withstand the corrosion of water containing sulphuric acid from mine drainage.

Copper-Molybdenum iron containing 0.80 – 1.00% Copper and 0.30 – .40% Molybdenum met all the requirements of strength, hardness and acid resistance. The lock-gate valves have been in service 2½ years without noticeable signs of corrosion or erosion.

Investigation may show where you, too, can apply Molybdenum iron to advantage. Our technical book "Molybdenum in Cast Iron" which contains wealth of practical data, will be sent free on request to interested production executives and employees.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

(*Concluded from page* 36)

that foundry, he left to become affiliated with the Aetna Brass Co. He also has been connected with the National Bronze & Aluminum Co. of Cleveland and for 5 years was a partner in the Advance Bronze Co., Cleveland. He was superintendent of the Robey Bronze Co., Cleveland, for a number of years.

* * *

THOMAS D. JOLLY, director of purchases and chief engineer, Aluminum Co. of America, Cleveland, recently was elected president, National Association of Purchasing Agents at the group's twenty-fourth annual international convention.

* * *

PARKER F. WILSON, has been elected president, Pittsburgh Steel Foundry Corp., Glassport, Pa. He formerly was associated with Wheeling Steel Corp. and at one time was vice president and general manager of Otis Steel Co.

* * *

RAYMOND L. COLLIER, secretary, Steel Founders' Society of America, was elected a director of the Cleveland chapter of the American Trade Association Executives, the national professional organization of trade association administrators, at a meeting on June 2, 1939.

* * *

J. R. WARK, Queen City Sand & Supply Co., Buffalo, and secretary, Buffalo Chapter of the A. F. A., sailed June 21 as a member of the U. S. Rifle team to compete for the Pershing trophy at Bisley, England. Mr. Wark is one of 12 men picked for the team from the sharpshooters of the United States.

* * *

FREDERICK J. HEASLIP, chairman, Business Survey committee of the National Association of Purchasing Agents, was the recipient of Shipman medal awarded annually to the executive whose service is considered to have contributed most toward the advancement of purchasing. Mr. Heaslip is purchasing agent for Fairbanks, Morse & Co., Chicago.

* * *

DR. C. O. SAPPINGTON, Chicago, was named winner of the W. S. Knudsen award for the outstanding contribution to industrial medicine during 1938-39 at the twenty-fourth annual meeting of the American Association of Industrial Physicians and Surgeons held in Cleveland recently. The award was made on the basis of Dr. Sappington's new book, "Medicolegal Phases of Occupational Diseases."

* * *

PAUL C. FASSOTTE, managing director, Rotary Furnace Ltd., Brussels, Belgium, has been making a tour of several foundry centers in the United States including New York state, Ohio, Detroit, Chicago, Milwaukee, and Los Angeles. On June 12, Mr. Fassotte was a guest of the Chicago Chapter of A. F. A. at the regular monthly meeting.

* * *

FRANK W. KLATT has returned to the W. W. Sly Mfg. Co., Cleveland, as general manager, a position he formerly occupied from 1920 to 1927. In the intervening period Mr. Klatt has been engaged in an executive capacity with one of the large automotive industries, principally in foreign countries. Most recently he spent 6 years in India.

* * *

SAMUEL L. HOYT, formerly director of metallurgical research, A. O. Smith Corp., Milwaukee, has become

Samuel L. Hoyt

a member of the staff of Battelle Memorial institute, Columbus, O. Mr. Hoyt will act as technical advisor in the planning and conduct of metallurgical research, according to Clyde E. Williams, director. Dr. Hoyt is known particularly for his leadership in the development of cemented tungsten carbides for cutting tools and for his work on temperature resistant alloys.

* * *

EDWIN J. SCHWANHAUSSER has been elected vice president, Worthington Pump & Machinery Corp., Harrison, N. J. Mr. Schwanhausser became connected with that company in 1915, at the time of his graduation from Stevens Institute of Technology. Assigned to the works at Harrison, he served in a number of capacities, reaching the position of assistant works manager in 1927. In 1929 he was transferred to the Buffalo works as works manager, which position he now holds.

* * *

W. E. DAY JR., recently elected chairman of the Metropolitan New York-New Jersey Chapter of the American Foundrymen's association, has been chief metallurgist for the Mack Mfg. Co., New Brunswick, N. J., for 18 years. He first became affiliated with the organization in 1913, with what was then the Saurer plant of the International Motor Co. in Plainfield, N. J. Much of his early experience was in the testing division. Later he was transferred to the metallurgical department at New Brunswick, N. J., and there received his first direct contact with the foundry industry, when, in 1919 the company established its departments for the casting of iron, bronze and aluminum. In addition to being affiliated with the American Foundrymen's association, Mr. Day is a member of the B-7 committee on light metals and alloys of the American Society for Testing Materials, and is connected with the American Society for Metals and the Society of Automotive Engineers. He is active on the E-P lubricant committee of the latter organization.

* * *

GEORGE W. KNOTTS, district manager, United Engineering & Foundry Co., Youngstown, O., has retired after 52 years in the steel industry. He has been succeeded by ERNEST E. TROSS, who for the last 7 years has been general superintendent. Mr. Knotts was born in Baltimore, and attended Baltimore schools. When 20 he joined A. Garrison Foundry Co. as a draftsman. At that time he went to night school and studied engineering, so in 1893 he became mechanical engineer for National Rolling Mills, McKeesport, Pa. About 1901 he joined the Lincoln Foundry, Pittsburgh, as general superintendent and a short time later the company became a unit of United Engineering & Foundry Co. Mr. Knotts was appointed district manager of Frank Kneeland plant, a part of the United company. In 1912 he went into the Pittsburgh offices as manager in charge of mechanical operations, the position he held until he was appointed manager of the Youngstown, O., plant in 1917. The summer of 1936 he was sent to Ebbw Vale, Mommouthsire, England, to supervise construction of a new plant for the Richard Thomas Co., returning to this country in December, 1937.

The Metal Industry Publishing Co. Inc., 116 John street, New York, has published a 92-page book entitled, "Plating and Finishing Guidebook." It is divided into 10 sections devoted to various phases of plating and finishing metals, and relates to equipment for plating, surface treatment of metals, plating solutions, hydrogen ion concentration of plating solutions, stripping of metallic coatings, metal coloring, lacquer problems, thickness of metallic coatings, analysis of plating solutions, and tables, data and definitions.

GREY IRON FOUNDRY KNOCKS OUT CORES EASIER

BIG SAVING MADE IN TIME AND LABOR

with TRULINE BINDER

Reg. U. S. Pat. Off.

TRULINE BINDER saves in many ways. For example, a Southern grey iron foundry put in Truline Binder with these results:

1. **SAVING IN TIME.**
2. **SAVING IN LABOR.**
3. **NO INCREASE IN BINDER COST.**

Big savings in time and labor were made possible because Truline Binder made it easier to knock out the cores.

When Truline makes it easier to knock out cores, it also helps to knock down costs.

So it goes. In foundry after foundry, Truline Binder is cutting costs, producing better cores, and speeding up work. The advantages listed here will show how you, too, can save money by using Truline Binder.

WHY TRULINE BINDER CAN HELP YOU

- Low initial cost.
- Pulverized to a uniform fineness.
- Does not absorb moisture.
- Makes strong, permeable cores that will not sag.
- Makes cores that collapse as metal shrinks.
- Burns out completely, reducing cleaning costs
- Helps to eliminate cracks, especially in high-shrinkage castings.
- Helps to produce smooth, strong castings.
- Permits easy control in reproduction of core properties.

Can be used wherever metals are cast.

Use the coupon for more complete details

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Reader's Comment

EDITOR'S NOTE — *Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of The Foundry or of Its Editors.*

Hardness

TO THE EDITORS:

I have just read the excellent article on centrifugally cast brake drums appearing in the June issue of THE FOUNDRY.

In describing the final operation you state that the ideal hardness is 94 Rockwell C. Do you not mean Rockwell B?

In describing the surfacing of the inner portion of the steel band with a flux, you state it is of a borax and soda ash material sprayed on. Is it possible to get the mixture percentage and vehicle used in making this fluxing?

K. F. SCHMIDT
Metallurgist
United Engineering & Foundry Co.
Canton, O.

Editor's Note: The hardness should have been Rockwell B, not Rockwell C as printed. The flux used for coating the steel is 70 per cent soda ash and 30 per cent borax with water used to make it liquid.

Cupola Drop

TO THE EDITORS:

Referring to coke reclaimed from cupola drop has doubtful value in your June issue, I can't just agree as to the doubtful value. As a matter of interest, some years ago I took a bushel sample of coke from the cupola drop and had it analyzed with the following result: Metallic iron 0.93 per cent, sulphur 0.56 per cent, fixed carbon 90.33 per cent, volatile 0.24 per cent, ash 8.50 per cent, moisture none. Practically no change from fresh coke except in volatile matter running lower and a pick up in metallic iron.

The original sample in this case was perfectly dry. Water used to quench the drop had all evaporated. I have tried the same thing a number of times with the same result. Moisture of course depends on how much water is used when drop coke is quenched. However, any moisture picked up in this way, rapidly evaporates in the cupola and does no harm when coke is charged any place after the first 6 or 8 charges. We operate two 72-inch diameter cupolas, each one on alternate days. We place 3000 pounds of coke on the bed, with 450 pound splits between the 4000-pound charges of iron. No coke on last charge. Bed will take care of the coke required.

Coke reclaimed from the drop, 1000 to 1200 pounds means a saving of $5.00 per day. We have used the drop coke with good results any where during the heat. Several times I have timed the charge with drop coke to note any change in temperature of iron at the spout, but found no change of any kind. Temperature of our iron always is above 2800 degrees Fahr. Up to the present I have not seen any difference between using drop coke and fresh coke in the cupola.

H. M. HAZELTINE
Cupola Foreman
Fremont Foundry Co.
Fremont, O.

Refractory Core

TO THE EDITORS:

In a recent issue of THE FOUNDRY I noted an inquiry for a suitable core wash for a core exposed to severe conditions in a brass casting. Experience of the writer with a special casting may supply the answer. Assuming that the cores are rodded and vented properly the interior is formed with ordinary backing sand. Facing sand approximately ¾-inch thick is made up of 40 parts 80 mesh washed silica sand, 1 part bentonite, 1 part first quality core oil and water to temper. For especially severe service the mixture contains 36 parts silica sand and 4 parts silica flour.

The mixture is mulled dry for 1 minute. Then the water is added to the extent of 5 per cent and not over 6 per cent. All measurements are volumetric and must be accurate. The oil is added last and the mixing process is continued for 6 minutes. This facing will produce a firm, smooth face on the core after it is baked slowly at a temperature of approximately 400 degrees Fahr. The cores are not washed in the green state. After the cores have been removed from the oven and cooled down to a temperature of about 100 degrees Fahr., an oil silica wash may be applied with swab, brush or spray gun. The cores then are returned to the oven long enough to dry out the moisture in the wash. Cores made and treated in this manner will have a smooth, tough surface slightly brown due to the oil in the mixture.

Steel castings in which these cores were used had perfectly smooth skin and presented no cleaning problem. The cores collapsed readily and thus obviated any shrinkage or contraction hazard. Since the cores had no moisture drawing ingredients they remained in first class condition even where they had to stand unused for a time. This factor is important in the prevention of surface or pinhole porosity.

JOHN J. WINCHESTER
44 *Josephine avenue*
West Somerville, Mass.

Heating Value

TO THE EDITOR:

In the June, 1939 issue of THE FOUNDRY in the Questions and Answers section, page 40, appeared a comment on "Coke Reclaimed from Cupola Drop Has Doubtful Value."

It is true that this coke, because of slag contamination, is less desirable than new coke, but the article further states that the coke has also lost approximately half of its heating value as measured in B.t.u.'s per pound. May I correct this impression?

Coke from coal is the carbonaceous residue remaining after the gases and tars have been removed by distillation. The residue, a hard, dense material, consists of carbon, ash and small percentage of volatile matter.

In burning this material the surface only is progressively consumed with very little change occurring in the heart of the piece, so that a reduction in the heating value per pound of the clean remaining material is relatively nil.

B. P. MULCAHY
Research Engineer
Citizens Gas & Coke Utility
Indianapolis, Ind.

To Hold Conference

A national conference which will benefit every branch of industry is being planned by the National Industrial Advertisers association to be held in New York, Sept. 20 to 22 at the Hotel New Yorker, under the sponsorship of the Technical Publicity Association of New York and the Industrial Marketers of New Jersey. According to Edward A. Phoenix, Johns-Manville Corp. and chairman of the General Conference committee, the 1939 national conference is being planned definitely to stimulate business in the marketing field. The program will consist of general sessions and a series of eleven clinics. At the general sessions outstanding speakers will discuss phases of industrial marketing that are of special importance today. In the clinics, problems in industrial marketing submitted by association members will be analyzed.

Great Lakes Carbon Corp., Chicago, recently organized, will continue the business of Great Lakes Coal & Coke Co., of that city. George Skakel is president and Walter Gramm, vice president.

WELL-EQUIPPED . .

From Raw Material Source to Finished Product . . .

to Take Care of Your Alloy and Carbon Steel and Pig Iron Requirements

A portion of the Hawkins ore mine, located in the Mesaba range.

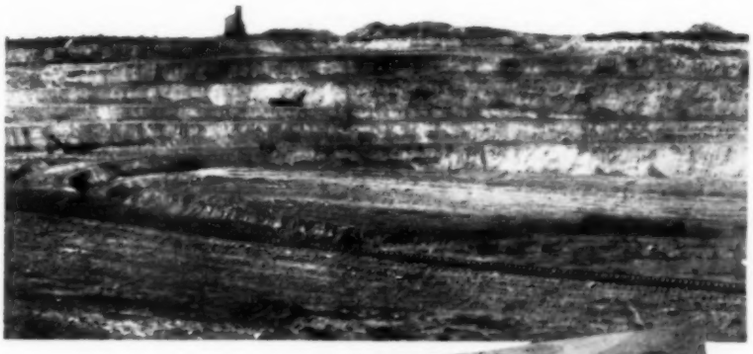

Photo by Chicago Aerial Survey Co.

Above: The Wisconsin Steel Company plant from the air, a complete plant with facilities for every step in alloy and carbon steel and pig iron production. *Right:* Wisconsin Steel's three modern blast furnaces produce all grades of iron required by the foundry industry.

Every step in the production of Wisconsin alloy and carbon steel and pig iron is carefully controlled to keep product-quality high. From the time the ore leaves our mines until the finished product leaves our mills at South Chicago the most thorough and up-to-date methods are used to insure uniform quality. Every operation is carried out with the customers' specific needs in mind.

We invite users of alloy and carbon steel and pig iron to write or phone us for complete information about our products.

WISCONSIN STEEL COMPANY

180 North Michigan Avenue Chicago, Illinois

WISCONSIN

Alloy and Carbon Steel Pig Iron

FOUNDRY DEVELOPMENTS AT SHORT RANGE

ACCORDING to an investigation, magnesite brick or crushed magnesite with a suitable bonding material can be employed as an effective means for control of the cooling speed of castings. Compared with steel or iron chills magnesite has a lower initial chilling effect, and can be used for chilling much larger areas than is practicable with iron chills, without danger of surface casting defects. Magnesite used at re-entrant angles is said to fulfill the cooling conditions required to attain the same solidification period in junctions as in the adjoining sections. Cooling ratio found experimentally was approximately double the cooling capacity of molding sand. Castings of over 20 tons weight were cast with large areas built in magnesite brick without the least deleterious results; the desired effect of solidification was fully obtained.

* * *

In instruments subjected to wide temperature variations, difficulty is encountered frequently in variations in readings due to changes in viscosity of the lubricants employed. However, it is claimed that use of a recently developed, extremely fine, colloidal graphite which can be suspended in carbon tetrachloride or other highly volatile liquids, will overcome lubrication trouble. The volatile liquid evaporates leaving a thin, dry film of graphite on the bearing parts.

* * *

NEGLECT of proper maintenance of lighting fixtures and lamps is said to waste two-thirds of the dollar spent for good lighting. Hence, to get the utmost value out of lighting equipment it will be well worthwhile to clean the fixtures once every month; clean the lamps and do not operate them past their prime; maintain the correct voltage at the outlets, and operate the fixtures with the correct wattage — have no empty sockets.

* * *

An aluminum-base bearing alloy which is claimed to give excellent results contains 5.5 to 7 per cent tin, 1.5 to 1.8 per cent nickel, 0.6 to 0.9 per cent copper, 0.7 to 1.0 per cent magnesium, 0.15 to 0.3 per cent iron, 0.2 to 0.45 per cent iron, and remainder aluminum. It is said that the alloy has the fatigue resistance of lead bronze, the antifriction characteristics and corrosion resistance of white metal, and the mechanical strength of silver.

* * *

It is reported that American foundries and steel mills have used as much as 38,000,000 tons of scrap in a single year, from automobile and other sources, conserving 5 tons of raw materials—iron ore, coke, and limestone—for every ton of metal reworked.

* * *

AN INVESTIGATION of nickel containing bearing bronzes conducted in France indicates that the bronzes which best respond to conditions of good lubrication are those containing 5 to 6 per cent tin, 4 to 5 per cent nickel, and 32 to 35 per cent lead. Nickel has the effect of dispersing the lead particles and of postponing the appearance of lead segregation toward high lead content, and both of those effects increase the lubricating qualities of the bronze.

* * *

In plating departments where the work is dried in sawdust, use of electric strip heaters in the sawdust box has shown many advantages. It aids in removing the water absorbed by the sawdust so that it may be used for a longer period, and the warm sawdust dries the metal parts more rapidly.

* * *

MOST recent development in production of converter steel is the employment of the photoelectric eye for gaging the flame condition and regulating the blowing period. It is claimed that the device is not affected by such variables as fatigue, inattention, poor physical condition, etc., to which the bessemer operator, depending upon his eye, is subject. Tests of the photoelectric device over a period of months are said to show it highly successful in achieving uniform quality.

HEAT treatment of an aluminum bronze containing 88 per cent copper, 9 per cent aluminum and 3 per cent iron will increase the yield point considerably with little change in tensile strength and elongation. That alloy heated to 1560 to 1650 degrees Fahr. and quenched, and then reheated to about 1080 degrees Fahr. will increase the usual yield point of 24,600 to 31,360 pounds per square inch to approximately 40,300 pounds per square inch.

* * *

Study of four different aluminum-base alloys melted under normal foundry conditions without use of any surface protection shows that repeated melting, without addition of new material, has no marked effect on tensile strength and elongation. Hence, trouble encountered may be attributed to use of scrap of unknown composition or bad melting practice.

* * *

Cause of a defective casting is not always a singular condition, but rather a series of conditions which are cumulative in effect and which may be classified as direct and indirect. For example a blow may be caused directly by high moisture, and low permeability, and indirectly by high green sand strength, high mold hardness, or high facing material. Hence, it is advisable to study the possible causes carefully before trying a remedy.

* * *

Difficulty encountered in centrifugally-cast, nonferrous pipes and tubes from splashing of metal when poured into metal molds was overcome in a German foundry by lining the molds with thin copper sheets from 0.04 to 0.12-inch in thickness. In the same plant the fissuring and oxidation of the inner surface of the pipes and tubes was prevented by providing a curtain of hot gas in front of the mold aperture which prevents escape of hot air from the mold, and entrance of cold air. It is claimed that the pipe have a smooth, metallically clean inner surface without appreciable oxidation.

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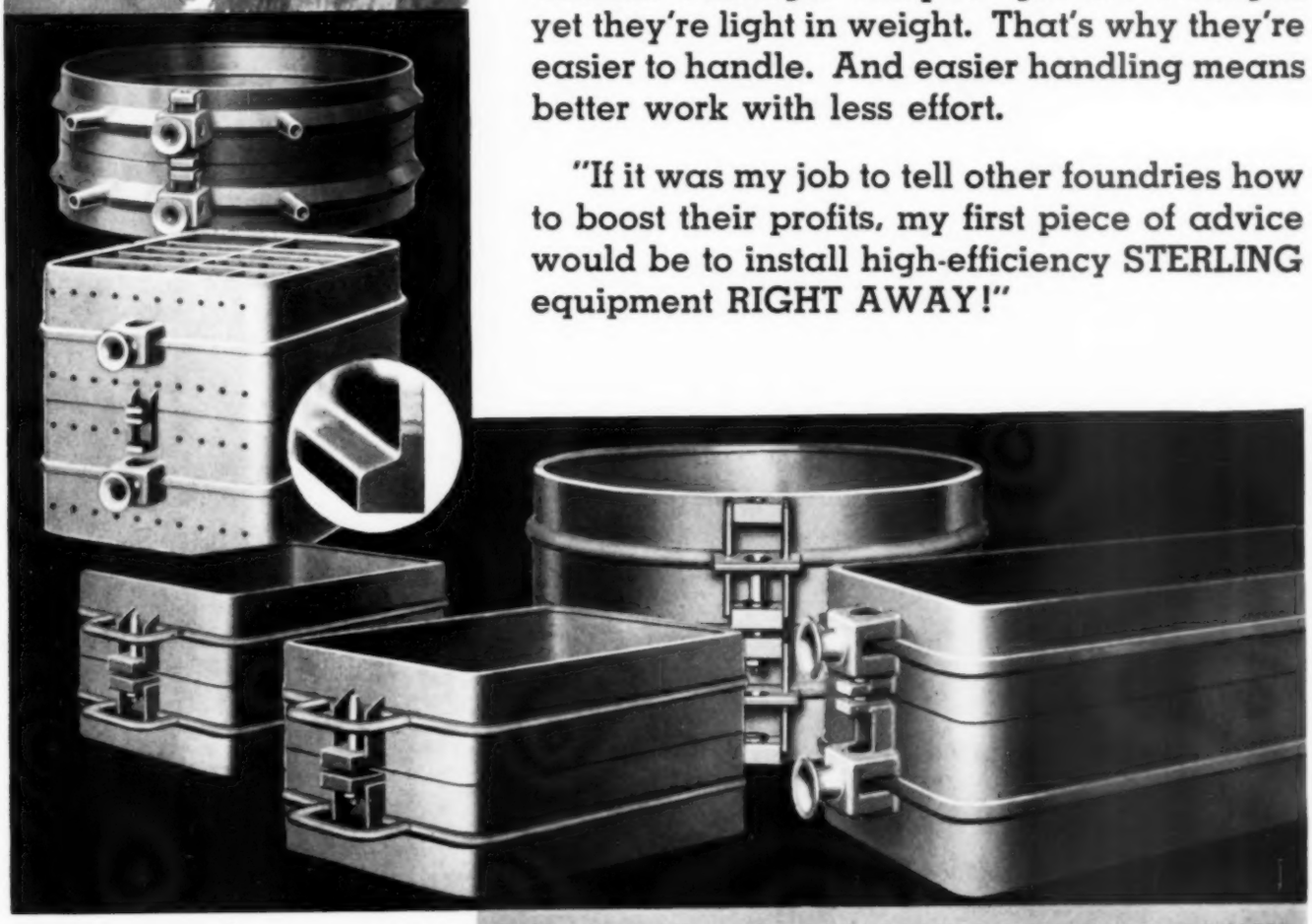
that when we put through our modernization program and installed Sterling Flasks, the improvement showed up right from the start. Costs went down and production went up! With this modern equipment, our force began turning out top-notch work—faster and easier than ever before.

"We found that Sterling Flasks can't break, can't burn; they stand the roughest handling without damage. They've got the strength, yet they're light in weight. That's why they're easier to handle. And easier handling means better work with less effort.

"If it was my job to tell other foundries how to boost their profits, my first piece of advice would be to install high-efficiency STERLING equipment RIGHT AWAY!"



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Convention Attracts Attention

A WIDE variety of technical sessions featured the annual meeting of the American Foundrymen's association held in Cincinnati May 15 to 18. So extensive were the events demanding attention that space did not permit presentation of all technical reports in the June, post-convention issue.

Therefore, reports of sessions on core and molding sand problems, gray iron casting properties, shop courses on cupola operation, apprentice training and castability of ferrous and nonferrous metals and alloys, are presented in the following pages.

Discussed Cupola Practice

Under the chairmanship of John Grennan, University of Michigan, Ann Arbor, Mich., the speaker, Donald J. Reese, International Nickel Co., New York, discussed cupola practice from many theoretical and practical angles at the opening shop course session. With modern conditions where nearly all gray iron castings must conform to much higher standards than formerly, where alloys are added extensively and where irons of exceptional strength are required, operation of the cupola is an important factor and merits highly skilled attention. As a preliminary the speaker pointed out that there are five zones in the cupola, namely a preheating zone, melting zone, superheating zone, cooling zone and a well or storage zone. Detailed reference was made to each zone, the part each one played in the operation of melting and the importance of synchronizing the time factor in the entire stack. Mr. Reese stressed the importance of thoroughly heating the cupola before commencing to charge. The usual cause of cold iron on the first tap is the amount of heat absorbed by the damp bed and lining. In addition to selecting coke with a high carbon content, attention also should be paid to selecting coke of a suitable size as compared with the diameter of the cupola. For example on a 36-inch diameter cupola maximum efficiency is attained with coke no larger than 3 inches in cross section.

Discussing slag, the speaker pointed out that iron begins to melt some time before slag is formed. Therefore it is desirable to add some flux to the bed before the full height is reached. Slag may be removed from the cupola either through a slag hole at the back, or through a slagging spout in front. With the aid of a slide on the screen the speaker explained the mechanism and operation of a front slagging spout and also compared the advantages and disadvantages of the device. With a constantly running stream of metal the front slagging spout is finding increased usage. The speaker does not favor an open tap hole after the wind goes on. He claims that the tap hole should be stopped with a piece of dry sand core. The front slagging spout is suitable for continuous tapping on any size cupola. The metal leaves the cupola at a higher temperature and with a lower carbon content than where intermittent tapping is employed. A reservoir ladle is preferable to the well of the cupola as a holding reservoir.

Control Carbon Content

On the subject of controlling the carbon content of the iron, Mr. Reese stated that it is possible to operate a cupola in a manner to control the carbon content within a plus or minus variation of 0.05 per cent. However, good carbon control is shown where the variation is kept within a plus or minus variation of 0.10 per cent. For example a variation between 2.95 and 3.05 carbon content is not regarded as a factor of any importance. In the use of steel scrap to lower the carbon content he pointed out that decreasing the carbon content of the charge is only one of a number of factors involved in attaining the desired carbon content. Amount of coke in the intermediate coke charges, size of the coke, method of operating the cupola, quality of the coke and the method of tapping are important. Up to the present no laboratory test has been devised to tell whether one coke may be more satisfactory than another.

Good practice essentials include: Sizes and weights of materials should be in proper relationship to the size of the cupola. The bottom sand should be screened, tempered and bonded. Height of the bed should be adjusted to suit type of operation. Time allowed for burning the coke bed should be long enough to allow the sand bottom and lining to attain maximum temperature. The cupola should be slagged to produce hotter and cleaner metal. Method of tapping should be controlled accurately. Use enough air so that the cupola will melt at not less than its normal melting rate. Try to hold the metal temperature loss in the cupola spout and metal handling circuit to not more than 150 degrees Fahr. Use a ladle to hold two charges. Check the iron for total carbon and tensile strength.

M. A. Scott, Greenlee Foundry Co., Chicago, discussed production of uniform dense structure in high test and alloy iron castings at the second session of the gray iron shop course, under the chairmanship of P. T. Bancroft, Moline, Ill. The speaker described experimental work conducted while pouring metal into castings through risers instead of gates. The work confirms many of the conclusions arrived at by C. Brisbois and A. E. Cartwright as presented in a paper at the 1938 convention of the American Foundrymen's association in Cleveland.

Description and illustrations of a great number of castings were presented to show that the temperature of the sand surrounding the neck or junction between the riser and casting had as much if not more bearing on the successful feeding of the casting than actual temperature of the iron. Success of the old foundry practice of gating in the thin sections was explained as not being due to the last or hottest iron in these thin sections, but to the effect of the heavy flow of iron heating the sand surrounding these sections and thereby retarding the cooling rate.

Create a Hot Spot

Time-temperature charts made from data secured through setting thermocouples in hot sand and castings not only checked foundry experience, but fully bore out the possibilities of deliberately heating the sand to create a hot spot and thereby permit efficient feeding with the smaller necks and risers.

The speaker hoped that through discussion and experiences a suitable formula may be developed which will determine minimum sizes of neck, ball and riser required to produce sound castings from any pattern. The meeting closed with a general discussion including a written comment from C. Brisbois and A. E. Cartwright dealing principally with the theory of progressive and direction solidification.

Third gray iron shop course under the direction of K. H. Priestly, Eaton-Erb Foundry Co., Vassar, Mich., was held Wednesday morning. In the absence of discussion

(*Continued on page* 46)

Hydro-Blast OFFERS POSITIVE SAND CONTROL AND LOWER CLEANING COSTS BY A DUSTLESS METHOD

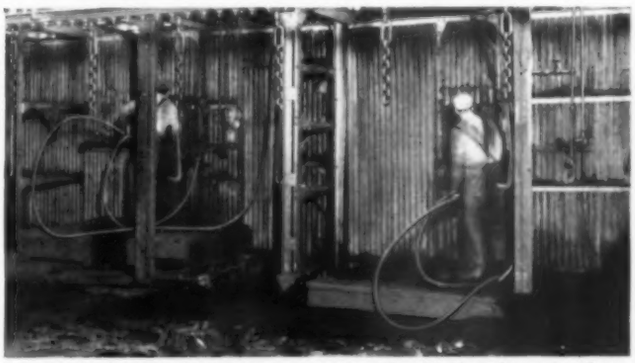
Behind sound castings which meet the customers' most exacting requirements, the foundryman needs positive control of his sand.

In addition to cleaning castings in a dustless manner at a saving, the *Hydro-Blast* provides the base upon which a sand control program can be built. It delivers to the foundry and core rooms sand that is washed, dry, bond-free and classified according to grain size—not only today but every day.

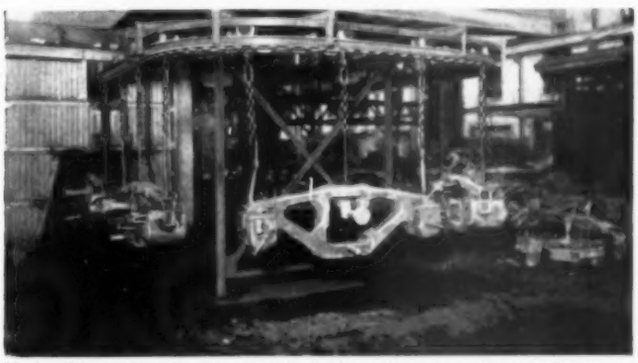
The correct amount of binder and moisture can be added to this sand to insure uniformity of every mix. Guess work can be eliminated by the *Hydro-Blast* method insofar as sand conditions affect casting quality.

The net result to a foundry using the *Hydro-Blast* method of sand control is the ability to manufacture better looking, sounder castings, and make them to closer tolerances than ever before. The improved condition of the castings results in lower cleaning room costs.

Gould Coupler Corporation continuous Hydro-Blast system showing one type of casting that is being cleaned at the rate of one per minute.

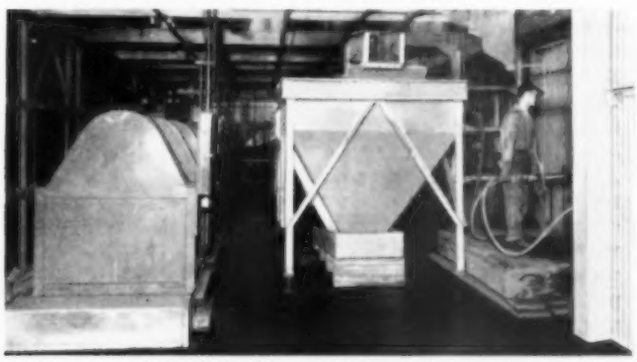


Two of the four Hydro-Blast operators at Gould directing guns from the outside of the Hydro-Blast continuous cleaning room.



Hydro-Blast is a dustless method that cleans castings and knocks out the cores without deformation of the casting.

Gray iron castings at the Nordberg Manufacturing Co. are either transported through the sixteen-foot door or lowered by crane through the open top, depending on their size.



Another view of the Hydro-Blast continuous cleaning room at Gould showing enclosed pumps, drive and blast sand tank.

Write today and let us tell you how Hydro-Blast cleans castings faster, better and without creating dust, while enabling you to build a sand control program.

HYDRO-BLAST Corporation

111 W. WASHINGTON ST. CHICAGO, ILL.

(*Continued from page* 42)

leader J. A. Bowers, American Cast Iron Pipe Co., Birmingham, Ala., the chairman called on Dr. J. T. MacKenzie from the same firm to act in his place. He read two papers prepared by Mr. Bowers which dealt with cupola refractories, and obtaining high carbon content iron in the cupola.

It was pointed out that at present a wide variety of shapes in cupola refractories are available to meet almost any requirement, and improvement in compositions of refractories has made it less of a problem to secure good results. However, to continue to make advances, it is necessary for the foundryman to co-operate as much as possible with the refractory manufacturer. Mr. Reed, Chicago Retort Co., Chicago, said that he had found in intermittently operated cupolas a coarse grain brick gave better results than a dense brick since the former spalled less.

Obtaining high carbon iron from the cupola, according to Mr. Bowers, depends on a number of factors of which coke seems to be the most important. Increased carbon is secured through a high bed, small coke size, and low ash content. Use of pitch coke increases carbon content. Intermittent tapping which permits longer contact with the coke also helps. For high carbon content the metal should be melted hot and the slag should be fluid. Also low silicon iron picks up more carbon than high silicon iron. Use of high carbon pig iron also increases carbon content of the castings. Rusty scrap tends to reduce carbon, and so do oxidizing conditions in the cupola.

Cupola in Blast for Week

The concluding gray iron shop course Thursday under the chairmanship of A. C. Denison, Fulton Foundry & Machine Co., Cleveland, featured a presentation on certain features of cupola operation by John Lowe, foundry consultant, Alma, Mich. Following a brief historical reference to early methods of melting, the speaker referred to many features of modern cupola melting technique as practiced at a prominent Michigan foundry where upon occasion the cupolas were in continuous operation and did not drop bottom for a week. Ordinarily the cupolas are in blast for 17 to 19 hours out of the 24. In the intervening 5 to 7 hours while the bottom doors are down, the lining is patched and made ready for the following heat. Replying to a question from the floor the speaker claimed that while old time cupola tenders were reluctant to work under the conditions outlined, no trouble was experienced in breaking in youthful help.

According to the speaker loose borings cannot be charged satisfactorily in the cupola. Two methods are available for the use of this material. In the first the borings are packed in short lengths of thin pipe. In the second and preferable method the borings are compressed into briquets weighing about 8 pounds and showing a density of approximately 80 per cent when compared with scrap or pig iron. Another advantage of the briquets is that small quantities of fluxing material or alloys can be incorporated. The briquets are dipped in a thin cement wash and the different classes of briquets are distinguished by adding different coloring pigments to the bath. Briquets are stored in stock yard according to color.

Long life of the cupola lining is secured through use of a water cooled chamber. A member on the floor contributed the information that the water bill of the company was increased approximately $20.00 per month on a 5 day per week operating schedule, melting 90 tons per day. Paul Townes, American Cast Iron Pipe Co., Birmingham, touched on some details of the operation of a cupola continuously for two weeks.

Apprentices Should Have Thorough Training

MEN must be trained more thoroughly and the training must be in the fundamentals of mechanics. This was the contention of Herman K. Ewig, Cincinnati Milling Machine Co., Cincinnati, who spoke on "The Training of Apprentices" at the apprentice training session, Tuesday morning. J. E. Goss, Brown & Sharpe Mfg. Co., Providence, R. I. served as chairman.

Mr. Ewig, in describing apprenticeship at his plant, stated that all apprentices are required to enroll in an evening school. The company pays the tuition for the course and each apprentice buys his books and supplies. Plant educational meetings are held weekly at which the boys are given the opportunity to speak in order to improve their leadership.

All shop work of apprentices is taken from regular production schedules. A control board is kept in the office and all the work of the boys is plotted. Upon completion of the course a bonus of $150 is paid by the company. The speaker pointed out that it is equally important to have a short training program for the purpose of balancing the manpower in the plant. This training, he explained, is a joint responsibility of the foundry superintendent, the foremen and the key men.

C. J. Freund, dean, college of engineering, University of Detroit, Detroit, inquired as to what means the speaker's company had of discovering boys who would make good mechanics and at the same time stressed the importance of choosing boys who are able to think straight. Mr. Ewig stated that a majority of the apprentices are sons or relatives of men working in his plant, and therefore have a good background. He pointed out that the committee never hesitated to call in the parent and explain why his boy wasn't chosen.

M. J. Gregory, factory manager, foundry division, Caterpillar Tractor Co., Peoria, Ill., in presenting his paper on "Foundry Apprenticeship," stated that no relatives are employed in the same department of the Caterpillar plant. In other words, a foreman of one plant cannot have a relative working for him, but the relative may be employed in another department. Over 600 boys are in training in the machine and pattern shops and in the foundry of his plant. He pointed out that the practice is to pay an hourly rate to apprentices and to ignore the bonus system. He expressed the opinion that the country will see more of this and emphasized that the sooner it comes, the better.

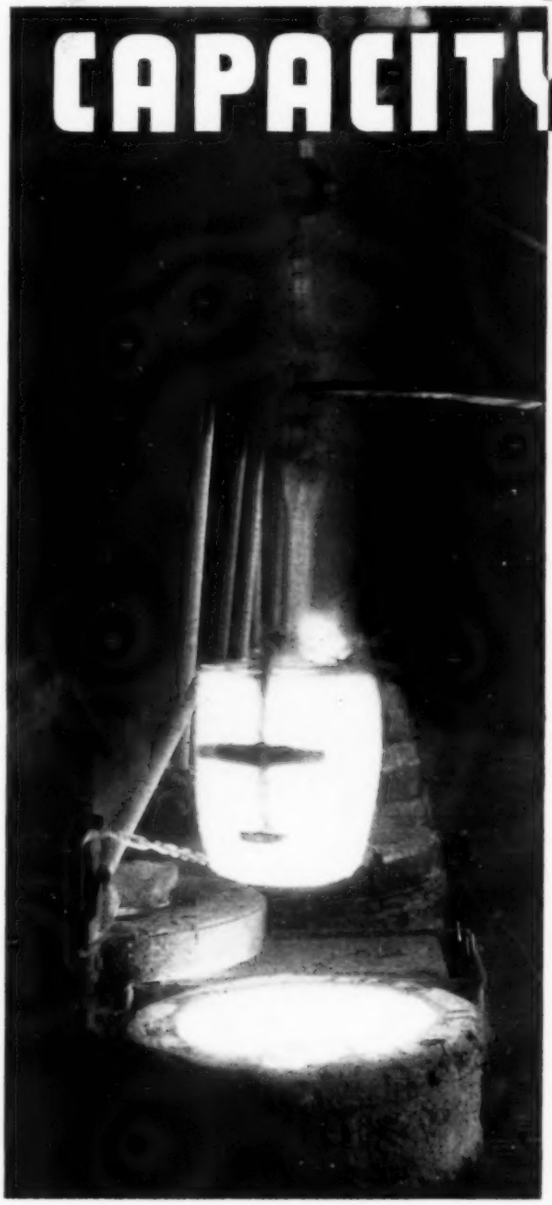
Foundry on Scientific Basis

He directed attention to the importance of studying every phase of the foundry industry pointing out that it is now on a scientific basis. Many foundries are being operated by patternmakers these days, he stated. It is important for the apprentice to have a knowledge of his casting as it leaves the machine shop and he advocated training the apprentice so that he is capable of checking upon the machining operations. Training men to make molds is just one part of the foundry industry.

It is important, he explained, that foundrymen know what kind of wood to use in making patterns.

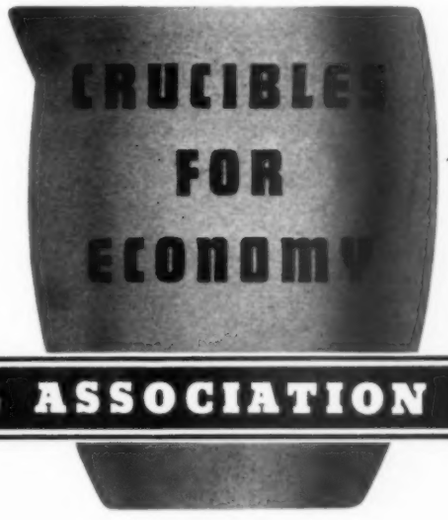
(*Continued on page* 48)

CAPACITY . . . UNLIMITED !



From a few pounds to many tons per day, crucible melting will maintain its economy of operation. A battery of crucible furnaces will cost no more to install than one large, inflexible unit. It is a simple matter to light more crucible furnaces when more metal is required. "Capacity unlimited" therefore, means exactly that when a foundry is equipped with modern crucible furnaces.

With present production of crucible melted nonferrous metal reaching a total of 1,175,000 gross tons annually, the use of crucibles in your foundry is not an experiment but a sound and proven process that will PAY REAL DIVIDENDS.



CRUCIBLE MANUFACTURERS ASSOCIATION

90 WEST STREET, NEW YORK, N. Y.

(*Continued from page* 46)

But it is just as important for him to take a blue print and draw lines to show where the partings and the cores are going to be located. He should have a knowledge of chemistry and metallurgy and of core oils. We can make molds by machines, Mr. Gregory stated in conclusion, but we require brains to set up these machines.

Foreman and apprentice training received attention is a well attended session held Wednesday morning with A. D. Lynch, J. I. Case Co., Racine, Wis., as chairman, and V. J. Hydar, Milwaukee, co-chairman. The first discussion presented was by A. R. Luebke, Fairbanks Morse & Co., Beloit, Wis., on "Foundry Apprentice Training—An Essential to Foreman Training." He pointed out that his firm limits training to high school graduates of good character and personal habits who have been recommended by the principal or school superintendent.

Six traits or characteristics which are considered necessary in young men entering apprentice training are interest; ambition; scholastic ability; carefulness; determination, and courtesy, and Mr. Luebke explained in detail why those traits were required. He then explained in detail the procedure of training foundry apprentices in his plant. He concluded by stating that no difficulty had been encountered in securing twice as many applications as could be accepted, and that apprentice training in the long run is profitable to both the firm and the apprentice.

W. G. Conner Jr., Walworth Co., Greensburg, Pa., presented the second paper which was entitled, "A Foundryman's Approach to Foreman Training" in which he gave a general outline of a 2-year foundry foremanship training course, and then proceeded to describe it in detail. He pointed out that while the course was designed specifically for a malleable cast iron foundry that it could be adapted to apply to any other branch of the industry without difficulty. At the conclusion of each paper considerable discussion was presented on various points.

Properties of Gray Iron Castings Discussed

THREE papers were presented at the gray iron session Tuesday under the joint chairmanship of Fred J. Walls, International Nickel Co., Detroit; W. R. Jennings, John Deere Tractor Co., Waterloo, Iowa, and Garnet P. Phillips, International Harvester Co., Chicago. The first paper was written by L. A. Danse, Cadillac Motor Car Co., Detroit; the second by E. L. Roth, Motor Casting Co., Milwaukee, and the third, the official exchange paper, Institute of British Foundrymen, by F. Whitehouse, Newton, Chambers & Co. Ltd., Chapeltown, England.

In the absence of Mr. Danse his paper was presented in abstract by H. B. Swan, foundry superintendent, Cadillac Motor Car Co. The paper dealt in detail with experimental work to determine the cause of a crack in the central web of a cylinder block and the means adopted to solve the problem. Following an apparently obvious theory that the crack was caused by stresses set up in cooling a number of thermocouples were placed at strategic points in the green sand body cores and the readings plotted.

Final solution of the problem was found in construction of an oven through which the castings pass immediately after they are shaken out, and in which the temperature is maintained at approximately 1200 degrees Fahr. for 3 hours and then lowered gradually. The treatment is somewhat similar to that accorded cast iron car wheels, with the exception that the period is not so long.

In the second paper Mr. Roth described the procedure for producing iron having a tensile strength of 60,000 pounds and more per square inch. Total carbon content is in the vicinity of 3.10 per cent. By proper cupola manipulation the iron is machinable in castings as small as 3-pound gears. A table was presented showing physical properties and chemical analysis of 64 consecutive heats. Illustrating the potential possibilities of this iron the speaker stated that test bars heat treated and quenched in oil showed an ultimate tensile strength of 91,000 pounds per square inch.

The paper by Mr. Whitehouse described some of the castings employed in the British gas industry, with detailed reference to molding and coremaking methods and materials, also the chemical and physical properties of the irons which have proved most suitable. Castings are made almost entirely in green sand. A naturally bonded sand is used, mixed either by hand or being put through a pin type disintegrator. Facing sand contains approximately 10 per cent fine coal dust (200 mesh) and the new sand addition varies from 5 to 30 per cent. In comparison with American sands the following data are of interest: Refractoriness 1710 degrees Cent.; sinter 1340 degrees Cent.; loss on ignition 2.00 per cent; silica 80.92 per cent; iron oxide 1.57 per cent; alumina and titania 6.87 per cent; lime 0.40 per cent; alkali oxides 2.76 per cent. In the absence of the author the paper was presented by J. E. Hurst, noted British metallurgist, who recently visited foundry centers in the United States.

Describes Temperature Device

A large attendance marked the gray iron session held Wednesday morning at which three papers were presented. Dr. J. T. MacKenzie, American Cast Iron Pipe Co., presided as chairman, and introduced Fulton Holtby, University of Minnesota, Minneapolis, who described an investigation of rapid temperature measurements of cast iron. Results obtained indicated that a tungsten-graphite thermocouple protected by a sillimanite tube gave good results. Advantages claimed are that high temperature measurements can be made, determinations can be made rapidly, not affected by smoke and slag, can be made smaller than other types, and is low in cost.

Second paper on copper, aluminum, silicon alloys for addition to cast iron by V. H. Schnee and T. E. Barlow, Battelle Memorial institute, Columbus, O., was presented by Mr. Schnee. The alloy contained 6 per cent aluminum, 12 per cent silicon, and 80 per cent copper. Results obtained indicate additions of 1 per cent of the alloy are effective in raising tensile strength and toughness as measured by resilience.

In discussing the paper C. O. Burgess, Union Carbide & Carbon Laboratories, New York, questioned the relation of results between ferrosilicon and the aluminum-silicon-copper alloy. He said that there was too much difference in the compositions of the materials. He believes that the final silicon and carbon contents of the irons used should be more comparable than given in the paper. Dr. Richard Schneidewind, University of Michigan, Ann Arbor, Mich., said that results obtained by the authors paralleled work he and his collaborators had performed. He pointed out, however, that deflection in the base iron was low, and that any addition at all would tend to increase that value. He asked how the

(*Continued on page* 51)

ADVERTISING PAGES REMOVED

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aluminum-silicon-copper would work with high carbon alloys.

Final paper of the session was on undercooling influence on graphite pattern of gray iron by Richard Schneidewind and C. D. D'Amico, University of Michigan, Ann Arbor, Mich., which was abstracted by Dr. Schneidewind. Results indicated that gray iron is susceptible to under cooling, undercooling may be as great as 100 degrees Fahr. below the theoretical equilibrium freezing point and still produce gray iron; solidification temperatures between 2060 and 1970 degrees Fahr. will produce graphite patterns characteristic of actual freezing temperature, the lower the temperature, the finer will be the graphite and the greater the tendency for a eutectiform pattern; greater degrees of undercooling will inhibit precipitation to form mottled and white iron, and undercooling increases the resultant austenite transformation rates.

Final session on gray cast iron was held Thursday morning with A. L. Boegehold, General Motors Corp., Detroit, as chairman and L. H. Rudesill, Griffin Wheel Co., Chicago, as co-chairman. A paper on "Influence of Composition on Electric Furnace Irons" by R. G. McElwee, Vanadium Corp. of America, Detroit and Richard Schneidewind, University of Michigan, was presented by Mr. McElwee.

Affect Physical Properties

As a result of their investigation the authors concluded that basis composition, carbon and silicon, markedly affect physical properties; that factor carbon plus one-third silicon is a practical means of determining the relationship; ladle deoxidation improves strength, deflection and charpy impact over a wide range of compositions, addition of up to 0.3 per cent vanadium increased tensile and transverse strengths and brinell hardness, and iron so alloyed showed greater uniformity from heat to heat.

Second paper by G. A. Timmons, V. A. Crosby, and A. J. Herzig, Climax Molybdenum Co., Detroit, on "Some Factors Involved in Hardening and Tempering Gray Cast Iron," was presented by Mr. Crosby. The authors heat treated one unalloyed and five alloyed irons in the conventional manner, by flame hardening, and in a manner suited to study effect of quenching temperature on combined carbon. They concluded in part that graphitization of unalloyed pearlitic cast iron takes place rapidly at 1300 to 1450 degrees Fahr.; effect of alloys on graphitization rate and transformation rate are useful in controlling hardenability, and quenching and drawing is an effective method for increasing hardness and tensile strength at some sacrifice in shock resistance, transverse strength, and deflection.

Third and final paper by S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago, dealt with the effect of heat treatment on combined carbon and physical properties of car wheel iron. More specifically it was concerned with the gray iron portion forming hub and web of the wheels. Results of the work indicate no decomposition of combined carbon occurs when the iron is heat treated at temperatures up to and including 1000 degrees Fahr. as long as 96 hours, and the physical properties as cast are not affected to any appreciable extent.

Heat treatment at temperatures just below critical causes substantial decomposition of combined carbon, degree of breakdown being dependent upon temperature. Decomposition of carbide practically is complete at 1200 to 1310 degrees Fahr. Most physical properties are lowered considerably, only impact strength showing an increase. When heat treatment is carried out above critical range 1500 to 1700 degrees Fahr. only a portion of combined carbon is decomposed; an equilibrium value of about 0.4 per cent residual combined carbon is established.

When distribution of graphite is normal the physical properties of gray cast iron are dependent upon structural condition of the matrix, and are best when the matrix is entirely pearlitic.

Castability of Metals Shows Variation

MANY theories in the perennial field of castability of metals, iron, steel, aluminum and malleable iron, were aired Tuesday afternoon under the joint chairmanship of W. H. Spencer, Sealed Power Corp., Muskegon, Mich., and George P. Halliwell, H. Kramer & Co., Chicago. Since fluidity or flowability of all metals present the same basic features, the four papers bore a relationship to a considerable extent in that temperature was stressed in each case as the most important factor to be considered. However, in each instance special modifying factors were described to show that high temperature of the molten metal does not offer a complete answer to the problem.

The first paper by C. H. Lorig and E. C. Kron, Battelle Memorial institute, Columbus, presented by Mr. Lorig, covered in considerable detail a series of experiments designed to determine factors responsible for free or sluggish flowing steel. Results of experiments seemed to indicate that temperature was the most important factor, with composition of the steel also in the running. In the ensuing discussion the point was raised that recarburizers and other ladle additions appeared to affect castability of the metal.

In a paper entitled "Effect of Superheating on Castability and Physical Properties of Cast Irons of Different Carbon Contents," N. A. Ziegler and H. W. Northrup, Crane Co., Chicago, described an interesting series of experiments. Commercial gray irons were melted in a high frequency induction furnace and cast into spiral castability molds and standard test bar molds. The metal was superheated, then cooled to varying temperatures. The carbon content was reduced from 3.00 per cent to 2.50 and then to 2.25 per cent.

Result of the experiments indicated that castability is increased by increasing carbon content, pouring temperature and temperature of superheat. Transverse bend strength, brinell hardness, tensile strength and proportional limit are increased by decreasing carbon. Higher pouring temperature increases these properties particularly with irons of lower carbon content. Superheating tends to eliminate free ferrite, refine and localize graphitic flake and break up dendritic formations. The most advantageous pouring temperature was found to be approximately 2800 degrees Fahr.

L. W. Kempf, Aluminum Research Laboratory, Cleveland, presented a paper written in collaboration with L. W. Eastwood of that organization, describing a series of experiments on the measurement of fluidity of aluminum casting alloys. The speaker pointed out that since fluidity of the casting alloy becomes important where thin sections are poured, a fluidity test should simulate these conditions. Instead of the usual spiral type of test, the surface area per unit of volume should be large.

Results obtained from the usual fluidity test spiral with round cross section, a minimum surface per unit of volume were compared with a new type of flat spiral having a cross section 1¾ inches wide and 1/16-inch thick. The two types of spirals produce quite different results. The flat spiral more nearly represents foundry conditions. Effect of tin and silicon on the fluidity of aluminum containing 3.75 per cent magnesium and the effect of iron on the fluidity of secondary metal also has been investigated through the flat spiral test which exposes a large surface as compared to the volume of metal.

Progress report on a series of malleable iron castability tests was presented by E. J. Ash, University of Michigan, Ann Arbor, Mich.

Core and Molding Sand Problems Studied

TWO papers were presented at the sand research session, Wednesday morning at which Henry S. Washburn, Plainville Casting Co., Plainville, Conn. served as chairman and William G. Reichert, Singer Mfg. Co., Elizabeth, N. J., as cochairman.

In speaking on "Properties of Resin Bonded Cores," Emile Pragoff Jr., Hercules Powder Co., Wilmington, Del., pointed out that hardness increases in a straight line function, while tensile strength and compression strength increase in parabolic function. Concentration of the resin binder has little effect on permeability of a core.

The speaker used several charts to clarify the data. In dealing with the effect of the baking temperature on the dry compression strength of resin bonded cores, he announced that the compression rises as the baking temperature is increased, reaching a maximum at 500 degrees Fahr. and declining rapidly thereafter. He attributed this to the destruction of the bond at temperatures exceeding 700 degrees Fahr. He announced that the increased demand for speed in core baking indicates a more extended use of resin binders. His observations on the baking of resin bonded cores indicate that many foundries prefer baking conditions of ¾-hour at 450 degrees Fahr. per inch of core thickness.

In presenting data to show the effect of moisture content on core properties of resin bonded cores baked 45 minutes at 450 degrees Fahr. the author mentioned that as the mix is increased, the compression strength and hardness improve, leveling off above 6 per cent. The tensile strength, however, drops rapidly between 3 and 6 per cent and levels off thereafter. Traverse strength reaches a maximum at 6 per cent, he stated.

One of the inherent natural properties of resin binders, he explained, is that they are not water absorbent. Hence, cores prepared from them do not become weaker on storage. Natural bonded sands are used effectively with resin binders, according to the speaker. When mixtures of new and reclaimed sand are bonded with a resin binder, they produce strong, hard but readily collapsible cores. A mixture of resin and cereals affords considerable better dry compression strength than either alone, the speaker declared.

H. W. Dietert, president, as coauthor with E. E. Woodliff, chief engineer, respectively, Harry W. Dietert Co., Detroit, in discussing "Hot Strength and Collapsibility of Foundry Sands," directed attention to the fact that moisture influences the hot strength of the sand up to temperatures through the 2000-degree Fahr. range. However, when 2500 degrees Fahr. is reached the effect of moisture is erased, he said.

The speaker used various charts to amplify his remarks. He showed that as the moisture increases from 4.5 to 6.4 per cent, i.e., from dry to heavy temper, the dry and the hot strength increases in the temperature range from 230 to 2000 degrees Fahr. The hot strength at 2500 degrees Fahr. has a tendency to decrease as the moisture increases.

For all grain sizes, the speaker explained, the hot strength decreases as the grain size increases, i.e., as the sand becomes coarser and the permeability increases. He attributed this behavior to the fact that the fine sand grains knit more closely thus causing higher load supporting capacity. The practical point to remember is that to increase collapsibility of a molding sand the grain size should be increased.

Mr. Dietert presented facts to show that the hot strength increases much faster than the green or dry strength. He warned that the green strength of a sand should be controlled closely to obtain a definite collapsibility of a molding sand.

With Mr. Washburn presiding at one of the Wednesday afternoon sessions, two papers were presented on certain phases of clay substances from a foundry viewpoint. The first paper entitled "Elements of Petrographic Study of Bonding Clays and of the Clay Substance of Molding Sands," presented by R. E. Grim, Illinois Geological survey, Urbana, Ill., briefly outlined modern methods for the study of clay materials, the prevailing concept of the composition of clays and the application of modern clay researches to studies of natural molding sands and bonding clays. Among other features the speaker pointed out that two molding sands, with the same fineness characteristics and the same amount of clay, will not necessarily have the same strength. The natural sands can not have the same strengths unless their clay is made up of the same clay minerals carrying the same exchangeable base.

Characteristics of sand grains and coarse silt in molding sand easily may be studied under the microscope. Clays generally or the clay substance of molding sands cannot be studied so easily because they are composed of particles so small that they cannot be seen even under high magnification. A fractionation procedure has been developed which literally takes the clay apart into fractions of its component minerals. Briefly the material is disaggregated and placed in suspension in water with ammonia as the dispensing agent. The suspension is allowed to stand until the material coarser than 2 microns has settled out. The process is repeated several times. Oriented aggregates are prepared of the material in the suspension and are studied with the petrographic microscope.

"Mineral Composition and Texture of Clay Substance of Natural Molding Sand" was the subject of the second paper of the session, presented by Ralph E. Grim, co-author with Carl S. Schubert, respectively, petrographer Illinois Geological survey and associate in Mechanical Engineering, University of Illinois, Urbana, Ill.

The paper covered in considerable detail experiments with samples of eight different molding sands. Six of these are in commercial use and the other two are potential Illinois molding sands. Size grade distribution of the clay substance was determined, minerals making up the clay substance of each sand were identified and the distribution of the important mineral constituents with respect to particle size was determined. Charts showing curves of the frequency distribution of the various samples were shown on the screen.

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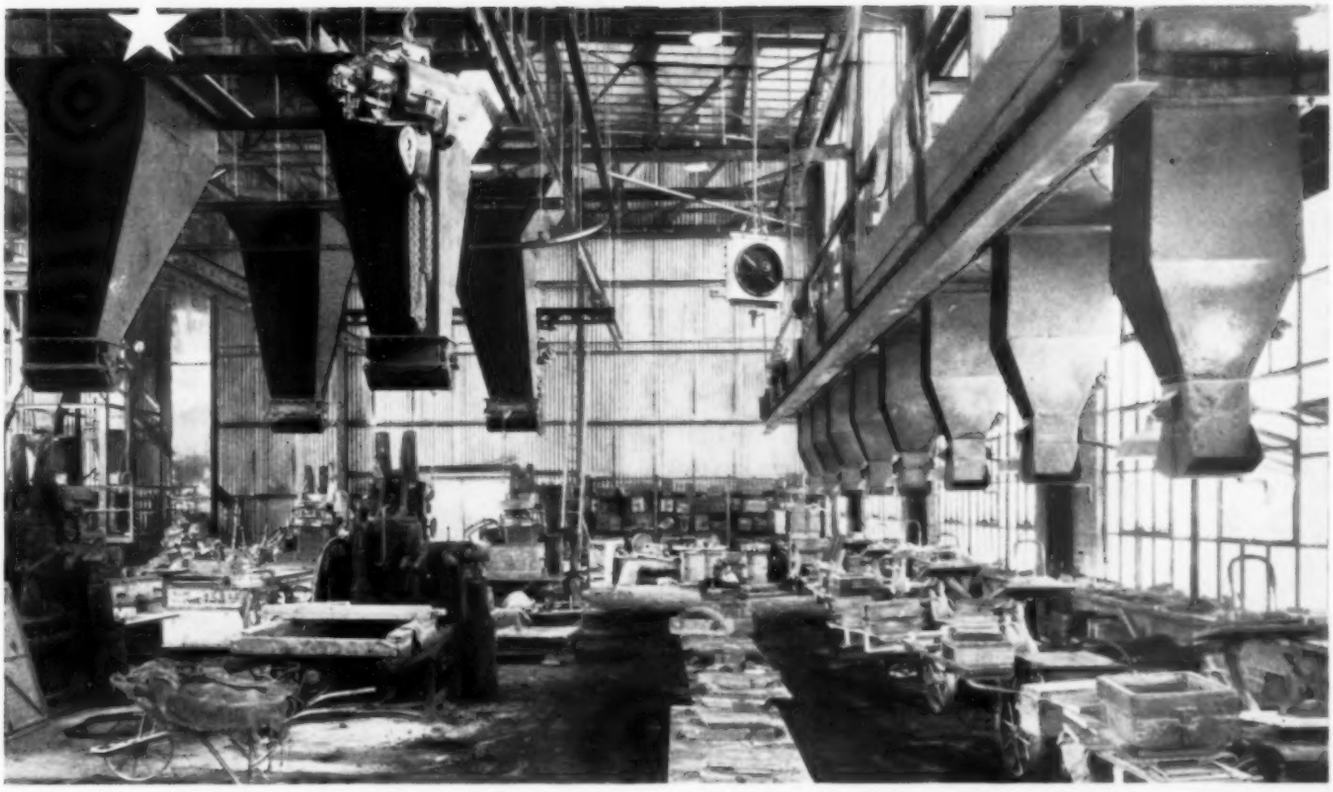

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BILL came in the other night while I was busily engaged in my usual useless occupation of sucking smoke through the stem of a corncob pipe and at the same time reading the evening paper. He flopped into an easy chair, stretched his long legs to the elastic limit, borrowed a pipeful of tobacco and a match and then asked if I had come across anything new and startling in that particular edition of the paper. I candidly admitted that reading the paper morning and night was a more or less vicious habit I had acquired in early life. If I was pushed into a corner I could not honestly claim that I derived any direct benefit from the habit. In fact on many occasions the perusal of certain items caused me to run a temperature, something that should be avoided carefully after one reaches the stage where he subsists principally on small portions of weak tea, toast and a saucer of gruel to be taken before retiring an hour or two after sunset.

"I don't know what kind of condition you are in," said Bill. "Maybe you are too weak to resist, but no one is going to spill any of that watery slumgullion into me so long as I can raise a hand, or preferably a foot in protest and so long as I have a voice strong enough to tell 'em to take it away and spill it down a rat hole. Gruel, sez he. Bah! I've used better stuff than that pasting cores.

"However, I agree with you fully when you talk about running a temperature over some of the items that appear in print. I don't mean stories that are printed as absolute truth one day and flatly contradicted the following day. History in the making is a very involved process particularly with a flock of paid propagandists in every country and with a censor board carefully suppressing anything that would do the reader any good. What I have in mind is sloppy writing and a total disregard for accuracy. If I know for a fact that a certain event occurred on a definite date, the old mental thermometer boils over when a writer apparently without a grammar school acquaintance, or ordinary memory calmly sets down a different date. Remember the story of the dumb kid who could not remember the date of the discovery of America even though he had the well known couplet for a guide 'In fourteen hundred and ninety-two, Columbus sailed the ocean blue'? Through some obscure mental process the rhyme always turned up in his mind as 'In fourteen hundred and ninety-three (sometimes eighty-three or twenty-three) Columbus sailed the dark blue sea.'

"You mark my words, that young figure juggler will grow up to become a writer and will continue to spread misinformation—"

Boys gaily hop the steps to top of Red Mountain

Experience of many years indicated that Bill had a pet grievance to air, but that according to his favorite beating about the bush methods, he would dodge around every bush in the vicinity before throwing a mooring line around No. 1. Clearly, in my capacity of host I would be conferring a favor on both of us by issuing a bit of antidodging propaganda. I asked him what he had seen lately to cause him to bare the old fangs, raise the hackles on the back of his neck and roar like Tarzan.

"Well," said Bill, "I'll tell you. At the recent convention in Cincinnati I ran into Sammy Ashton, one of the boys of the old brigade. I first got acquainted with Sam when we worked in the Fulton in St. Louis the year of the World's Fair. Which World's Fair? Why, the fair that was held in St. Louis of course in 1904. In fact that was the reason we worked in St. Louis at the time. Molders did not have automobiles in those days to dash hither and yon over the country at a moment's notice. When a man wanted to see a town or a fair, or simply developed a pair of itchy feet, he hopped a rattler, dodged the dicks at the destination, got himself a job and there he was all set to enjoy whatever was going on.

"Well, anyway as I was saying I met Sam and we got talking about one thing and another including the St. Louis fair and in that way my memory was refreshed on the date, 1904. One of the objects at the fair, an immense cast iron statue of Vulcan in the Alabama exhibit attracted a great deal of attention, particularly among men con-

(Continued on page 56)

PLUG THOSE PROFIT LEAKS!

EVERY time your equipment is operated a second longer than is necessary you are losing money. There is a loss of production, a waste of power and wear on equipment.

Time is a most important factor in a multitude of foundry operations—molding machines, sand mixers, all types of casting cleaners, sand feeders, power conveyors, furnaces, etc. and where constant time intervals are required or would indicate definite savings some form of control is needed.

The Herman Electro-Timer was developed to fill this need. It is not a "gadget". It is a timer built for accuracy where real accuracy is required, for use where the loss of fractions of a second on each of a series of operations for a period of a day would mean loss of dollars.

Operation of the timer is simple. Set the desired interval which may be any between two-tenths of a second and twenty hours on the dial. Press the "Start" button and when the set interval is completed the device automatically shuts off the machine, the mill, the conveyor, or other piece of equipment being operated. The operator need not count the number of blows nor otherwise clock the operation. All this is automatically done to within a fraction of a second accuracy.

Installation is simple. The timer can be operated either from a remote or a close position, as desired.

Herman Electro-Timers will start saving you money the minute they are installed. Fill in the coupon below and we will gladly quote on your requirements.

HERMAN PNEUMATIC MACHINE COMPANY:

Please quote us on ..... Herman Electro-Timers. We use electric power with the following characteristics:

Current { A.C. .... D.C. .... Voltage { 110 .... 220 .... Cycles { 25 .... 50 .... 60 ....

Pipe size of inlet .....

The approximate operating period we wish to use the timer for is: Minimum ....., Maximum .....

Name ..... Title .....

Company .....

Street .....

City ..... State .....

MOLDING **HERMAN** MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

(*Continued from page* 54)

nected in any manner with the foundry industry. Sam and I had more than a passing interest in the huge cast iron figure, because a few years earlier we had worked in Joubert & Goslin's in Birmingham and were acquainted with many of the molders in another foundry where the statue was cast after we had left the city on our regular northern pilgrimage. Our paths separated although we have met here and there."

"I remember the year 1904," I said. "I was toying with the idea of taking a run out to look at the fair, but the stork kind of hinted he was thinking of paying us a visit and that put a decided crimp you might say in the general agenda."

"Crimp is right," Bill admitted. "As a champion crimper and general buster-upper of programs, that bird is in a class by himself. I am sorry I cannot say as much for the discretion or lack of discretion he shows in distributing his burdens. Instead of dropping certain babies I have in mind down the chimney or hiding them under cabbage leaves he would have conferred a boon on humanity if he had put 'em on a raft and pushed 'em over Niagara Falls."

"Why, that is rank heresy," I pointed out horrified. "Even Herod would not think of a thing like that."

"Herr who? Oh, yes, I know the fella you have in mind. Never mind him for the time being. Let's get back to the cast iron Vulcan. The same week the convention was going on in Cincinnati, the city of Birmingham was staging a celebration in honor of Vulcan perched up on top of Red Mountain, the last of his many stops since he came back from the fair in St. Louis. Naturally I heard something about this from the Birmingham boys at the convention. Whenever the subject of dates came up, every one agreed that the old boy strutted his stuff at the St. Louis fair in 1904.

"With all that has been written and printed on the subject you would think that even the apprentice writers, the lads who have not yet achieved the coveted by-line, would get a few of the main facts right. Here's the way the story appeared in a magazine of wide circulation:

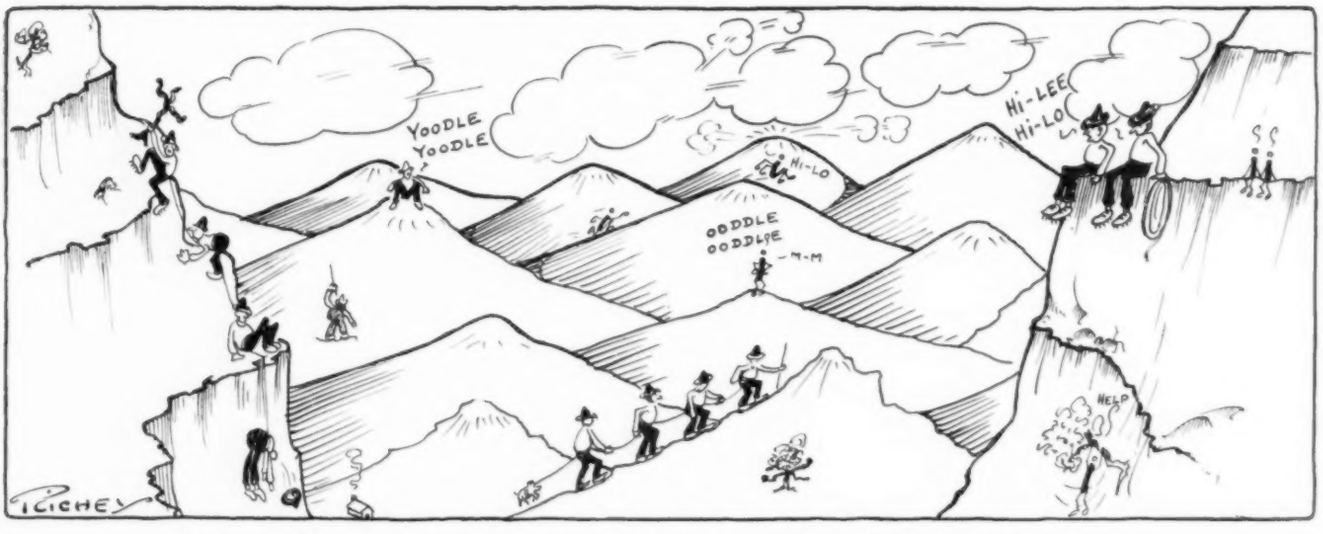
This statue of Vulcan, Roman god of fire and metalworking, has been erected on Red Mountain overlooking Birmingham, Ala. It is 55 feet high, weighs 100 tons, surmounts a tower 124 feet high, giving it an elevation of nearly 600 feet above the city. Reported to be the second largest statue in America and the world's largest cast iron figure, Vulcan has had an eventful history. Designed by G. Moretti, an Italian sculptor, it was cast in Birmingham from iron made from local ore by Sloss furnace, now part of the Sloss-Sheffield Steel & Iron Co., plant. Birmingham Commercial club sponsored the project as an exhibit at the St. Louis Louisiana Purchase exposition in 1903. Neglected for several years after its return, it finally was erected in Fair park, site of Alabama's state fair. In 1935 Thomas N. Joy, an Alabama engineer, and the late J. Mercer Barnett, past president Kiwanis International, proposed that the club place Vulcan on the mountain top. Dedication ceremonies were set for May 9-17.

"One afternoon during the convention I took an hour off to visit some of the boys of the old brigade over at International Molders' Union headquarters. Nick D. Smith, secretary, came originally from Birmingham and was one of the crew of 14 molders and coremakers who worked on the statue of Vulcan when it was molded and cast in the old Birmingham Iron and Steel Co. plant. Compilers of statistics on life expectancy in various occupations might be interested to learn that seven members of the crew have survived all the traps and pit falls and as you might say, still navigate under their own power. Two of these lively lads climbed the mountain at the recent celebration, a piece of work in my estimation only equalled by the leather lunged Alpine yodelers who leap from crag to crag and drag a string of tourists after them hitched at intervals in a long rope. Five of these men, H. H. Morgan, foreman; David C. Morgan, Clarence Hancock, George Bush and Fred Buetikker were treated as guests of the city and occupied an honor box during the festivities. Of the remaining two, Nick Smith is in Cincinnati and Dave Williams is a foundry consultant in San Francisco."

"To a certain extent," I said, "the statue is reminiscent of a past era, a souvenir of the foundry industry at a period when success depended principally on the craftsmanship, skill, knowledge and manual dexterity of the workmen. At the time the statue was made the machine had made little inroad in the foundry. Workmen had to know how to measure and lay out their work before they began. They had to design and in many instances make their own rigging. Practically all these features and many others now are taken care of in the engineering department, before the patterns are touched or before the patterns are taken into the foundry."

"Well," said Bill, "I'll tell you. Foundry practice and technique have been revolutionized to an almost unbelievable extent in the past 30 years. The basic principles remain the same. Molds are made in sand and iron is melted in cupolas, but the amount of skill and knowl-

(*Concluded on page* 72)



Modern yodelers on the proving ground throw a little swing into the old O-Lee-O-Lay-Ee-O!

Quad City

MAY meeting of the Quad-City Chapter of A.F.A. was held at the Fort Armstrong hotel, Rock Island, Ill., Monday, May 22. M. J. Gregory, chairman of the chapter, presided, with 75 present. Reports of the secretary-treasurer, auditing committee and trustee were read and approved.

The following officers were elected: Chairman, Horace A. Deane, Deere & Co., Moline, Ill.; vice chairman, Herman E. Alex, Rock Island Arsenal, Rock Island; secretary-treasurer, J. Morgan Johnson, Moline; directors, M. J. Gregory, Caterpillar tractor Co., Peoria; P. T. Bancroft, Moline; L. W. Starner, Frank Foundries Corp., Moline; Nathan Lesser, Deere & Co., Moline; L. E. Roby Jr., Peoria Malleable Castings Co., Peoria; E. C. Wussow, William-White & Co., Moline; Ray H. Wendland, International Harvester Co., Rock Island; Frank W. Wells, J. I. Case Co., Rock Island; and Earl Snoddy, Blackhawk Foundry & Machine Co., Davenport, Iowa. For trustee, M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill.

B. D. Claffey, General Malleable Corp., Waukesha, Wis., and vice president of the Wisconsin chapter, spoke on the events planned by that group during the year and the importance of the foundry industry and association with men of the industry through the chapters.

Main speaker of the evening, M. D. Johnson, chief inspector, Caterpillar Tractor Co., who discussed "Machine Shop Control of Inspection of Castings." He told of the importance of machine shop phase in regard to castings made in the foundry and the co-operation necessary in control of various departments involved.

Accuracy and inspection are of vital importance in placing a commercial product on the market and utmost care and attention should be given at all times to putting out good castings and finished product. Good castings for use by customers mean safety to all that use the article for which they are made. To bring this about various tests are made on them to control the inspection.

Maintenance of good inspection force is important and can be secured through proper training by conferences, tours, lectures and printed material on various operations and subjects. Knowledge of all operations and machines in the plant are to be known by all in the field—*J. Morgan Johnson secretary, treasurer.*

Chicago

CHICAGO chapter of the A. F. A. elected the following officers for the 1939-1940 season at the June meeting: Chairman, C. E. Westover, Burnside Steel Foundry Co., Chicago; vice-chairman, Garnett P. Phillips, International Harvester Co., Chicago; treasurer, C. C. Kawin, Charles C. Kawin Co., Chicago (re-elected); secretary, L. L. Henkel, Interlake Iron Co., Chicago (re-elected).

New directors elected are L. H. Rudesill, Griffin Wheel Co., Chicago, retiring chapter chairman; J. H. Abbott, Hickman, Williams & Co., Chicago, retiring entertainment committee chairman; L. F. Lottier, Peoples Gas, Light & Coke Co., Chicago; Bert Aamodt, National Malleable & Steel Castings Co., Cicero, Ill. H. K. Briggs, Western Foundry Co., Chicago, was re-elected and will serve out the unexpired term of Garnett P. Phillips.

A. L. Armantrout, Carnegie-Illinois Steel Corp., Chicago, will again head the apprenticeship committee, which has been combined now with the junior committee. C. E. Westover continues as chairman of the Rosenwald Museum Exhibit committee. New committee chairmen are L. H. Rudesill, Griffin Wheel Co., Chicago, regional conference; P. V. Martin, Carnegie-Illinois Steel Corp., Gary, entertainment; J. H. Abbott, Hickman, Williams & Co., Chicago, membership; G. P. Phillips, International Harvester Co., Chicago, program; and A. W. Weston, Chicago Hardware & Foundry Co., North Chicago, will head the lecture course.

At the last meeting of the 1938-39 season, held at the Medinah club, June 12, special awards were made L. H. Rudesill, retiring chairman, and four past chairmen of the chapter. The awards are bronze cast "Oscars"—statuettes of a molder pouring, and were specially cast for the chapter. Name of the recipient is engraved on the statuette in each case. Utilitarian as well as ornamental, the trophies have an ash tray hidden in the base.

Other past chairmen to receive the award include Don J. Reese, International Nickel Co., New York; James Thomson, Continental Roll & Steel Foundry Co., East Chicago, Ind.; Leon J. Wise, Chicago Malleable Castings Co., Chicago; Harold W. Johnson, Greenlee Foundry Co., Chicago.

It is planned to finish the foundry exhibit at the Julius Rosenwald Industrial Museum, Jackson Park, Chicago, in time for the regional conference next fall. Equipment for the permanent exhibit, which is being sponsored by the Chicago chapter, is on the location now, but installation has been delayed. When complete it will be a full-fledged foundry in operation.

The chapter has decided to continue the lecture course as a routine function each year because of the success of this year's course, attended by an average of 375. Crane Co. and Wisconsin Steel Co. were thanked at the recent chapter meeting for hospitality in plant visitations for members of the lecture course.

"Taxation Policies and Economic Consequences," was the topic of the speaker of the evening, F. N. Wil-

liams, assistant vice-president, First National Bank, Chicago. Mr. Williams pointed out that government now requires over 25 per cent of the national income, and never before has had such authority to collect it, or so many sources to collect it from. There are in the government over 175,000 separate taxing units. In 1935 there were 326 duplications of certain taxes. The speaker scored the undistributed profits tax, stating the only way to correct it was to abolish it.

Next assemblage of the chapter will be in September at the annual golf tournament, outdoor supper, and general reunion. Heavy attendance is expected; there were over 725 at last year's event.—*J. F. Powell.*

Buffalo

ANNUAL stag picnic and election of officers and directors of the Buffalo Chapter of the A. F. A. was held Saturday, June 3. Robert Molley, chairman of the nominating committee read the list which had been prepared and those nominated were elected as follows: Chairman, W. J. Corbett, Atlas Steel Casting Co.; vice chairman, John McCallum, McCallum Match Bronze Co. Inc.; treasurer, Robert K. Glass, Republic Steel Corp.; secretary, J. R. Wark, Queen City Sand & Supply Co. Newly elected directors are M. W. Pohlman, Pohlman Foundry Co. Inc.; Alexander Rankin, Lake Erie Engineering Corp., Kenmore, N. Y.; and J. J. Mayer, Lumen Bearing Co. The directors retained are V. M. Mazurie, Buffalo Foundry & Machine Co.; W. S. Miller, Charles C. Kawin Co.; R. T. Rycroft, Jewell Alloy & Malleable Co. Inc.; and J. P. Begley, Pratt & Letchworth Co.

The picnic was a success and baseball, quoits, shoe race, and dashes were enjoyed by the 100 members present.—*J. R. Wark, secretary.*

Birmingham

MEETING of the Birmingham District Chapter of A. F. A. was held May 12 at Hotel Tutwiler, Birmingham. Following dinner Chairman C. B. Saunders called on the nominating committee chairman, T. H. Benners Jr. to read the names of the officers and directors nominated for the coming year. Those nominated were elected as follows: Chairman, R. C. Harrell, Stockham Pipe Fittings Co.; vice chairman, W. O. McMahon, Sloss-Sheffield Steel & Iron Co.; secretary-treasurer, J. A. Bowers, American Cast Iron Pipe Co.; directors, W. E. Curran, R. R. Deas Jr., C. B. Saunders, A. S. Holberg, H. A. Newbury, W. L. Roueche Sr., L. N. Shannon.

Dr. J. T. McKenzie was asked to introduce J. E. Hurst, technical director of Bradley & Foster Ltd. and technical director of Sheepbridge Stokes Centrifugal Castings Co. Ltd., Darlaston, England, the speaker of the evening. However, he called first on G. W. Lunt, one of the chapter's visitors from England, who is managing director of Bradley & Foster, Ltd. Mr. Lunt described their experiences since coming to America the first time.

Mr. Hurst discussed "Heat Treatment of Cast Iron." The discussion following the talk brought out many interesting questions from those present and as equally interesting answers on the part of Mr. Hurst. The chapter greatly appreciates the kindness of Mr. Hurst and Mr. Lunt for coming to Birmingham for the purpose of appearing before the local foundrymen. It has been stated that Mr. Hurst is to be made doctor of metallurgy by Sheffield university, England, the second time this coveted degree has been award-

(*Continued on page 62*)

Buffalo Chapter holds annual stag picnic. Photos courtesy J. R. Wark, Queen City Sand & Supply Co., Buffalo

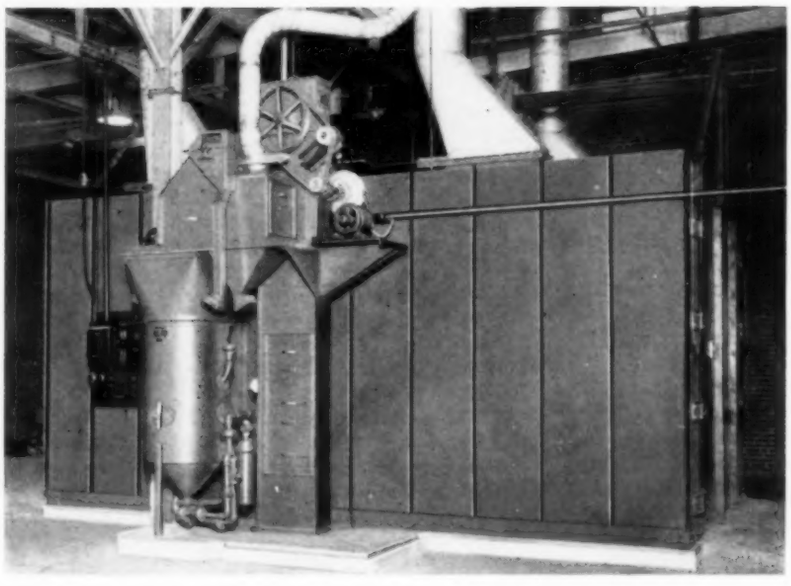
BLAST ROOMS ENGINEERED TO LOWER YOUR COSTS BY SLY

Interior of a Standard Sly Blast Room. Note standard ceiling construction which allows unobstructed passage for ventilating air over full room area.

SLY blast rooms are especially adapted to the cleaning of large and heavy castings. Their design complies with the rigid regulations of health authority and insurance companies.

These blast rooms are engineered to your requirements—of a size to accommodate most efficiently the particular size and weight of your pieces . . . planned for the efficient handling in and out of the room by conveyor, truck or car . . . designed to use the required cleaning apparatus to best advantage . . . ventilated and lighted for healthful, productive working conditions and equipped in every respect to keep cleaning and maintenance costs at a minimum.

Write us about your cleaning problems—benefit by Sly experience since 1874.



Side view of Sly Blast Room showing abrasive elevator, cleaner and pressure blast tank.

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Branch Offices in Principal Cities

BLAST CLEANING EQUIPMENT · TUMBLING MILLS
DUST CONTROL EQUIPMENT FOR EVERY INDUSTRIAL PURPOSE

(*Continued from page* 60)

ed by this university. The other recipient is Dr. Compton, president, Massachusetts Institute of Technology.—*W. O. McMahon, secretary-treasurer.*

Central New York

REGULAR monthly meeting of the Central New York Chapter of the A. F. A. was held May 26 at the Onondaga hotel, Syracuse, N. Y. Dinner was served at 6:30 p. m. with 75 members and guests in attendance.

H. H. Judson, chapter chairman opened the meeting by submitting his annual report together with a report prepared by the treasurer, reviewing the activities of the chapter and showing receipts and disbursements for the year. These reports were accepted unanimously by the members present and placed on file with the secretary. Mr. Judson then called on Walter Thomas, chairman of the nominating committee to present a slate of officers to be voted on for the next fiscal year. Following the report, the following officers were elected: H. H. Judson, Goulds Pumps, Inc., Seneca Falls, N. Y., chairman; Frank C. Wheeler, Kinman & Wheeler, Syracuse, vice chairman; L. D. Wright, United States Radiator Corp., Geneva, N. Y., secretary; E. J. Bair, Utica Radiator Corp., Utica, N. Y., treasurer.

Leo Lonergan, Morris Machine Works then presented the report of the recreation committee and announced that the annual picnic would be held at Three Rivers Inn, Three Rivers Point, N. Y., Aug. 26. All foundrymen of Central New York and other localities are invited to attend this outing.

Mr. Judson introduced C. E. Bales, vice president, Ironton Firebrick Co., Ironton, O., as speaker of the evening. Mr. Bales presented an illustrated talk on "Refractories for the Iron Foundry" and gave to the members present a comprehensive picture of the materials and manufacturing methods necessary to produce quality refractories. The speaker stated that the best refractories for the iron foundry are manufactured from hard flint clays. These clays are obtainable in Pennsylvania, Kentucky and Missouri. With lantern slides Mr. Bales illustrated methods used in preparing the clay and the machinery used to form the refractories under pressure of 1500 pounds per square inch. These refractories then are loaded on cars and placed in drying ovens preparatory to being placed in the kilns where they are subjected to a temperature of 2400 to 2500 degrees Fahr.

After discussing the subject of formed refractories, Mr. Bales spoke on the uses of monolithic linings. As he progressed on that subject a great many questions were asked from the floor concerning the mechanical handling of the material. Mr. Bales called on George S. Evans of the Mathieson Alkali Works to voice his opinion concerning the use of monolithic linings. Mr. Evans discussed at length the effects of different materials on such a lining and assisted in answering numerous questions asked by the members present.

Mr. Judson closed the meeting by announcing that the next regular meeting would be held the second Friday in October.—*L. D. Wright, secretary.*

Conn. Nonferrous

MEETING of the Connecticut Nonferrous Foundrymen's association in conjunction with a golf tournament was held May 24 at the Indian Hill country club, New Britain, Conn. Prize winners of the tournament were: George Winslow, Bradley & Hubbard Mfg. Co., Meriden, Conn.; H. E. Beckman, Springfield, Mass.; L. W. Beebe, Hartford, Conn.; W. J. Kenney, North & Judd Mfg. Co., New Britain, Conn. was in charge of the contest.

In the evening with H. A. Phelps, president of the group, presiding, F. B. Diana, Whipple & Choate Co., Bridgeport, Conn. discussed "Application of the Deep Etch Test on Nonferrous Castings." Mr. Diana's lecture was very interesting and he illustrated a large number of samples by reflecting test castings through a projector. These illustrations showed results of deep etching on castings poured at various temperatures and gated in different positions.—*Louis G. Tarantino, secretary.*

Pittsburgh

AT THE final meeting for the current year held in the Fort Pitt hotel, approximately 75 members of the Pittsburgh Foundrymen's association heard Pat Dwyer, engineering editor, THE FOUNDRY, present a running comment on many of the outstanding features of the recent A.F.A. convention in Cincinnati. According to the speaker the attendance was impressive, character and number of papers were up to the usual high standard, method of handling details, entertainment features provided and hospitality extended reflected the highest credit on the Cincinnati foundrymen. In his many years of attending conventions the speaker did not recall any that left a more pleasant impression.

If he was to offer a mild criticism it was to the effect that the great number of papers and the consequent simultaneous sessions prevented men from taking full advantage of the wide range of material presented by the different authors. However, he realized that the preparation of the annual A.F.A. program involved a great deal of care and study. Simultaneous sessions presented a comparatively minor factor since the majority of the foundrymen in attendance are interested only in one of the four major divisions, gray iron, malleable iron, steel and nonferrous. The address was followed by a brief discussion period devoted principally to features connected with the gating of castings.

At that meeting officers of the association were elected for the coming year: President, J. H. Johnston, Trafford foundry, Westinghouse Electric & Mfg. Co.; vice president, R. C. Heaslett, Continental Roll & Steel Foundry Co.; secretary-treasurer, C. H. Paul, Mackintosh-Hemphill Co.—*R. L. Hartford.*

Reading

THE regular meeting of the Reading Foundrymen's association was held at the Wyomissing club, Reading, Pa., on Tuesday, May 16 with President Julian B. Greenstreet presiding. Forty-six members were in attendance.

The speaker of the evening was Blake Hobbs, Reading employment agent who spoke on the subject, "Life of the Boss." The whole subject of industrial relations as a phase of public relations was reviewed by the speaker. Motives in industry were stressed in the opening remarks.

Mr. Hobbs then explained that restriction is widespread, and is deeply intrenched in the working habits of laboring people, that supervision is a major factor in attitudes of workers. Mr. Hobbs reviewed the results of recent investigations showing that many other factors beside money are at work in determining employe feeling.

He described the qualities that determine whether a man is a good foreman or not and emphasized the necessity of reinstating foremen to their former position of prestige in the workers' eyes. The speaker stated that foremen are fast losing any sense of responsibility they may have had in maintaining good labor relations. As Mr. Hobbs said, "Personnel managers are only nominal personnel men, the supervisors on the line are the real personnel men of industry."

He then drew a parallel of an executive buying a machine and taking a man on the payroll, and admitted that industry has put mate-

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(*Continued from page* 62)

rial purchases on an exacting basis, but deplored the tendency to hire what executives call hands. Industry does not buy hands by brains, hearts and dispositions. Workers have wills of their own, and the fundamental question for industry's future is whether or not it can harness those wills for the best interests of all concerned.

The next regular meeting of the association will be held the third Tuesday in September.—*H. C. Cummings, secretary.*

Detroit

DETROIT Chapter of the A.F.A. met at the Birmingham Country club, Birmingham, Mich., on June 1, to honor Ira F. Cheney, superintendent, Detroit plant of the Griffin Wheel Co., Detroit, and retiring chairman of the chapter, who recently was transferred to St. Paul as superintendent of the company's plant in that city. At the dinner in the evening, Mr. Cheney was presented with a set of matched golf clubs in appreciation of his splendid leadership of the Detroit chapter. The chapter also presented a movie camera to past chairman, R. B. Crawford of the Atlas Foundry Co. The presentations were made by J. D. Stoddard, Detroit Testing Laboratory, Detroit.

The report of the nominating committee recommended the following as officers during the coming year: Chairman, Harry W. Dietert, Harry W. Dietert Co., Detroit; vice chairman, J. H. Crawley, Pontiac Motor Co., Pontiac, Mich.; secretary, Harry W. Deutsch, Aluminum Co. of America, Detroit; treasurer, William W. Bowring, F. B. Stevens, Inc., Detroit. Directors elected to serve three years: Ira F. Cheney, R. G. McElwee, V. A. Crosby, Howard McCoy; for two years, R. B. Crawford, A. E. Boegehold, Fred Walls, F. A. Melmoth; for one year, E. L. Morrison, Otto E. Goudy, Glenn Coley, L. G. Korte. These men were elected at the meeting of the chapter held at the Clinton Valley Country club on June 15.

St. Louis

ANNUAL picnic of the St. Louis Chapter of the A.F.A. was held Saturday, June 10 at Joe Davies' Ferguson Country club. In spite of a terrific rain storm, the get-together was attended by the largest crowd ever at a St. Louis chapter picnic. Games of all kinds, indoor and outdoor, were the feature of the day, and an orchestra entertained during the afternoon. There was an abundance of barbecue, sausage, potato salad among other things, all washed down with copious quantities of St. Louis beer. Many attendance prizes were given through the co-operation of the supply men in the St. Louis area.—*J. W. Kelin, secretary-treasurer.*

Wisconsin

ON FRIDAY, July 21, Wisconsin Chapter of the A.F.A. will hold its annual golf tournament and stag dinner at Bluemound Country club, Milwaukee. Golf will start at 10 a.m., dinner will be served at 7 p.m. with seven acts of entertainment. The suppliers of the district have

Each past president of the Wisconsin Chapter receives a ring, as shown in the illustration, upon his retirement from the office. Roy M. Jacobs was the recipient at the annual meeting in May

contributed over 100 prizes. Committee in charge of arrangements includes: T. E. Ward, chairman, B. D. Claffey, Roy M. Jacobs, W. J. MacNeil, W. H. Underwood, H. E. Fellows, W. F. Bornfleth, H. E. Boschulte, M. J. Carpenter, John Bing.

New England

REGULAR monthly meeting of the New England Foundrymen's association was held at the Engineers' club, Boston, June 14. Howard J. Williams, sales manager, New Jersey Silica Sand Co., Millville, N. J., was the speaker, discussing "Processing of Molding Sands and Clay—Washing, Screening and Grading of Washed Sands." Moving pictures descriptive of the various operations were shown and proved interesting to the large number of foundrymen present.

The group was impressed with the housekeeping which was in evidence everywhere. The company's deposits of sands comprising 2000 acres are unique from a geological standpoint because of so many grades of foundry sands found there. The company is equipped with three large, up-to-date plants for washing, screening and grading washed sands, both round and subangular in shape. Two large screening and processing plants care for the molding sands and clays of various specifications.

Two large drying plants supply the trade with dry sands, sand blasting sand, filter sand, glass and chemical sands. A modern laboratory for testing foundry and other sands is located at the plant. Mr. Williams lived up to his reputation of keeping his audience interested and with his knowledge of the subject and foundry problems as well, his address proved to be very worthwhile to those present.—*M. A. Hosmer, reporter.*

Northern Iowa

ANNUAL meeting of the Northern Iowa Foundrymen's association was held May 23 at which the following officers were elected for 1939-40, to take office in September: President, Fred C. Nus, John Deere Tractor Co., Waterloo, Iowa; vice president, Carl Gosline, John Deere Tractor Co., Waterloo; secretary, R. E. Wilke, John Deere Tractor Co., Waterloo; treasurer, F. Eastman, Viking Pump Co., Cedar Falls, Iowa; sergeant-at-arms, J. Robinson, Construction Machine Co., Waterloo.

The picnic committee was appointed and plans for the outing were completed.

Following election of officers some of the highlights of the recent convention of the A. F. A. at Cincinnati were discussed by W. R. Jennings and R. E. Wilke. A general round table discussion on pertinent foundry problems was held for the balance of the meeting.

Next regular meeting of the group will be held on Sept. 26.—*R. E. Wilke, president.*

Southern Steel

TECHNICAL and operating group, division 3, Steel Founders' Society of America, held its trimonthly meeting June 2, at the Roosevelt hotel, New Orleans. At this well attended session discussion subject were: Deoxidizers and ladle practice with a resume of melting practice and general foundry problems taking up a portion of the period. Highlights of the convention were talks by C. W. Briggs, technical advisor to the society and Thomas C. Ford, metallurgist, Electro Metallurgical Sales Corp. Mr. Briggs gave an excellent treatise on deoxidizers, furnace practice and the bonding of synthetic molding sands. Mr. Ford spoke on the origin and necessity of deoxidizers, their functions and the various types.

Attendance included the following: C. W. Briggs, Steel Founders' Society of America, Cleveland; Thomas C. Ford, Electro Metallurgical Sales Corp., Cleveland; F. G. Russel and H. A. Smith, Florida Foundry & Machine Co., Jacksonville, Fla.; G. B. Hall, DeSoto

Foundry & Machine Co., Mansfield, La.; J. L. Blair, Dedman Castings Co., Houston, Tex.; P. H. Stuff, Ross-Meehan Foundries, Chattanooga, Tenn.; B. J. Peters, and C. W. Goodon, Service Foundry, New Orleans; J. T. Weatherford and Mr. Slater, Dibert, Bancroft & Ross Co. Ltd., New Orleans; J. K. Osburn and W. J. Temple, Kincaid, Osburn Electric Steel Co., San Antonio, Tex.; Mr. Tyus, Caldwell Foundry & Machine Co., Birmingham; V. R. White, Mobile Pulley & Machine Works, Mobile, Ala.; A. B. Wilkerson, Beaumont Iron Works Co., Beaumont, Tex.; and L. H. August, Hughes Tool Co., Houston, Tex.

At the round table discussion following the regular program, many pertinent facts regarding melting and molding practice were discussed. Members were asked to present individual foundry problems and each received the necessary cooperation to assist in overcoming these difficulties.

Since its inception last year, the Southern division of the Steel Founders' society has increased its membership to nearly 100 per cent of the Southern industry. Being widely scattered geographically, it is sometimes impossible to have complete attendance at each meeting, however, the members are finding the common ground discussion of their technical and operating problems sufficient to remove the distance barrier.

Next scheduled meeting for this group will be Sept. 15, Hotel Roosevelt, New Orleans.—*A. B. Wilkerson, chairman.*

Elastic Properties

National Bureau of Standards, Washington, has published research paper RP-1176 on "Elastic Properties of Cast Iron," by A. I. Krynitsky and C. M. Saeger Jr. The paper, which contains 16 pages, describes an optical method for measuring deflection of cast iron, transverse test bars during loading and presents data obtained on three types of cast iron.

Book Review

Pick Your Job and Land It, by S. W. and M. G. Edlund, published by Prentice-Hall, Inc., New York, and supplied by THE FOUNDRY, Cleveland, for $3 and in Europe by the Penton Publishing Co. Ltd., London.

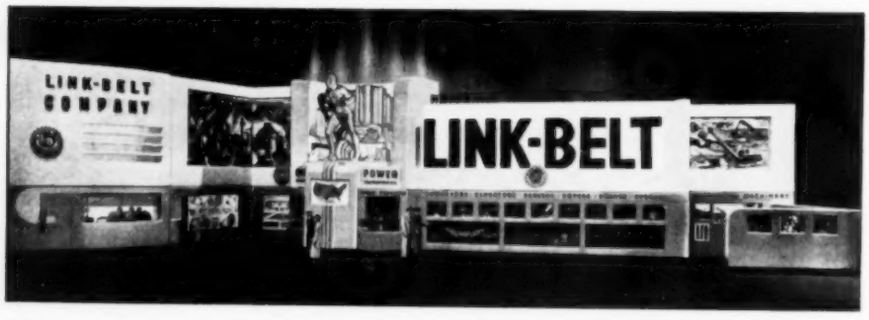
Much of the material in this book was developed in a man marketing clinic whose object was to assist men and women to get the jobs they want. Every Monday evening for over 3 years, from 40 to 150 people met at the clinic. The group included both unemployed and many employed seeking better jobs. Problems considered included means of getting leads, criticism of letters, advertisements of presentation, enacting sample interviews, and other phases encountered by those searching for a job.

The book gives specific methods that have in many cases produced results. It shows how to fix a definite goal, how to discover abilities and talents, and how to secure the right prospects.

Moves Sales Office

Whiting Corp., Harvey, Ill., has moved its Chicago district sales office from the Franklin-Adams building to the Fisher building, 343 South Dearborn street. Personnel of the Chicago office consists of Robert S. Hammond, vice president; L. D. Reed and G. M. Dennis, sales engineers.

Shows Functions of Machinery at Fair



LINK-BELT CO. is participating in the New York World's Fair as part of a broad program intended to familiarize the general public with the vital functions of machinery in making life better for all. The exhibit at New York tells the world how machinery has freed people from the task of working all their waking hours for life's necessities. This illustration shows the entire exhibit with photomurals, translites, diaramas, and equipment operating units.

Chicago Will Hold Fall Conference

Second annual regional conference of the Chicago chapter of the A.F.A. will be held Nov. 9, 10, and 11 at the Julius Rosenwald Museum of Science and Industry, Jackson Park, Chicago, according to plans now being made. L. H. Rudesill, Griffin Wheel Co., Chicago, is chairman of the conference committee. Program arrangements have not been completed, but it is seen as likely a feature will be ceremonies in connection with the official opening of the museum's permanent foundry exhibit, sponsored by the Chicago chapter.

Sponsor Malleable Training Course

Malleable Founders' society is sponsoring an eight-week intensive training course, which began June 26, at Rensselaer Polytechnic institute, Troy, N. Y., according to Executive Secretary Robert E. Belt, Cleveland. The course is restricted to employes of the society's member foundries. Purposes of the undertaking are product betterment in the malleable industry and training of young men in basic technology of malleable production.

Theory and practice both are included; lectures and discussions being reinforced with laboratory and shop work. Dr. M. A. Hunter, head, department of metallurgy, is supervising the course with Professors Scott Mackay, Augustus Jones and H. M. Sullivan are giving full-time instruction. Prof. Enrique Touceda, emeritus head of the department and for the past 25 years consulting engineer for the Malleable society, is assisting in the instruction, and J. H. Lansing, shop practice engineer of the society, Cleveland, is handling subjects related to shop operations.

Subjects included in the course are: General metallurgy, chemical analysis, pyrometric practice, spectrographic analysis, radiography, sand testing, physical testing, metallurgy and metallography of malleable, and malleable foundry practice. Systematic plant visitations in nearby industries is planned.

Results will be watched with interest and already consideration is being given to repetition of the course every other year as a standing project of the society.

American Engineering Co., Philadelphia, recently purchased the Diamond Machine Co., Providence, R. I. and will continue to manufacture the diamond face grinder in its Philadelphia plant.

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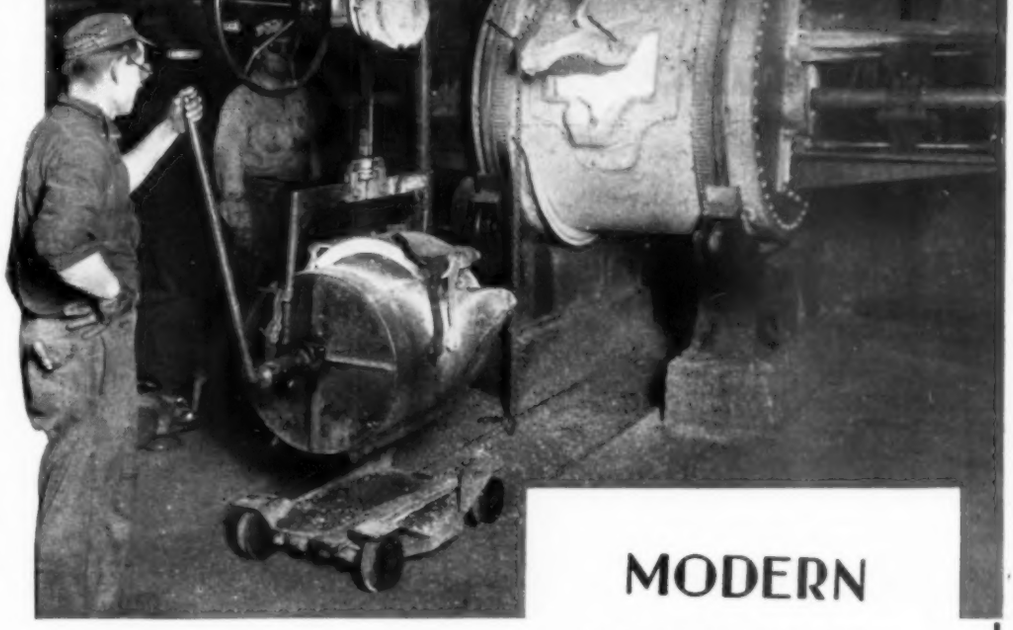

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MODERN EQUIPMENT CO.

Fig. 11—General view of entire installation, with sand preparation and dust collection equipment in foreground

Modernizes Ancient Foundry

(*Concluded from page* 21)

veyor and fall over the drive end shown in Fig. 4 to be collected in steel drums and carried away to be incorporated in the cupola charge.

Modernization of the cleaning room in which the castings are packed in pots with gravel from overhead bins, annealed and then shaken out on a large vibrating table from which the castings are sorted and loaded into steel containers, is worthy of an article by itself and lies outside the scope of the present discussion.

Sand Mixed in Two Units

A general view of the sand preparation plant with dust collector at the extreme left is shown in Fig. 5. A second illustration Fig. 11 shows the sand preparing, sand handling and mold handling equipment supplied by the National Engineering Co., Chicago. The outfit includes two 8-foot diameter, latest design, unit drive intensive mixers auxilliary equipment for proper conditioning and fines control, and a double loop mold conveyor with 32 molder's stations.

Sand from the shakeout station falls on a belt under the floor and is discharged into the boot of an elevator which carries it aloft. The sand passes through a revolving screen and then is carried on a belt on which it may be deflected to fall into either one of two large hoppers. The under side of each hopper terminates in a chute and gate through which measured amounts of sand are fed into the mixers. Sand is tested regularly in a well appointed laboratory in the vicinity and in this manner standards of bond, permeability, grain size and moisture content readily are maintained. Practically all the variable factors have been taken out of the variable class and established on a standard basis. Clay and sea coal additions are measured accurately and an automatic device regulates the amount of water added to each batch. In this particular installation the castings usually are small and light, therefore the sand is not burned to any great extent. For the same reason the problem of handling hot sand, encountered in other types of foundries, is not encountered. The finished sand is warm, but not to a sufficient degree to detract from its workable condition.

Batches of sand are mulled alternately in the two mixers and in that manner a practically continuous stream of prepared sand is discharged to the belt which carries a supply to the hoppers above the molding machines. These hoppers hold a sufficient amount to keep the machines in operation for a considerable period and thus form an elastic link in the chain of operation in the remote event of intermittent supply from the mixers or from any other cause that conceivably might interfere with a smooth, continuous performance.

Presents Neat Appearance

Mounted on concrete pedestals the compact, neat and orderly sand mixing unit, as shown in several of the accompanying illustrations, fully meets modern foundry good house keeping standards in suppressing the dust nuisance. From the shakeout to the delivery point every dust producing station is covered and the dust is removed by air suction.

The two mixers are mounted in tandem and in line with the two parallel groups of hoppers over the molding machines. With this arrangement a single belt over the center carries the sand from the mixers to the hoppers. As each batch of sand is discharged from either of the mixers it falls through a chute on to a short horizontal belt from which it passes through an aerator and falls through a second chute to the long belt which serves the hoppers. From a point below the floor level the belt travels up a steep incline and then travels the remainder of the distance horizontally. Adjustable plows above and in contact with the belt may be set to divert the flowing stream of sand to each hopper in turn, or to any hopper in the group in need of replenishment at any time. Under maximum operating conditions the system is capable of delivering approximately 60 tons of sand per hour. Position of the belt between the mixers and the welding stations is shown in the illustration, Fig. 11.

Fig. 12—Castings are carried on conveyor from shakeout to sorting and distributing stations in an adjoining department

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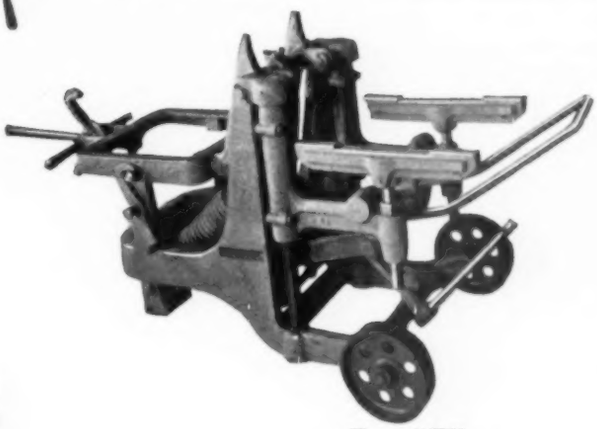

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Type "JR"
Power Jolt Hand Rollover and Draw Core Machine

Rollover Draw machines will handle a wide range of work. Difficult jobs requiring uniform ramming and accurate draw are produced as fast and easily as the simple jobs.

CHAMPION ROLLOVER DRAW MACHINES are simple in design, adjustment and operation.

If you have a job for any of the above machines, we will gladly ship equipment on trial. Send sketch, flask dimensions and production requirements for our recommendations.

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Nonferrous Alloys Available

(*Continued from page* 22)

vided with adequate risers of ample height to insure proper feeding of all heavy sections. Risers must be large enough to prevent their solidification until the casting is solid, and high enough to provide the proper static head to force the metal into the casting during the feeding process.

Due to heavy shrinkage characteristic of aluminum bronze it is desirable that the castings be of such shape and cross section as to avoid the necessity for feeding the points that are difficult to reach with the proper risers. Sudden change from thin to thick sections must be avoided by the provision of ample fillets. Designers will do well when considering the production of castings in those alloys to discuss or consult with competent foundrymen before completing the design of the casting, so that foundry problems may be anticipated and provision made for the proper feeding of all parts of the castings.

It is particularly important that patterns for production of such castings be made by foundrymen conversant with production of castings of those alloys. Patterns that otherwise might be entirely satisfactory for ordinary bronzes and brasses might give serious trouble in producing castings in aluminum bronzes. However, if the patterns are produced by those able to anticipate problems that will arise in the production of castings in the high shrinkage compositions, much economy should be derived and good castings assured.

Metal for aluminum bronze, should be melted properly. The composition is gassed very easily and when melted in the presence of underburnt gases invariably will give trouble. When properly produced the soundness of these castings is exceptionally fine and the characteristics of the best cast parts from well made aluminum bronze are invariably up to the standard covered by the specifications listed in Table VI presented in the June issue. Necessity for feeding the castings cannot be emphasized too vigorously. This means that the best aluminum bronze castings can be made only by those willing to provide adequate feeding and who have had experience in the production of such work as to know how to feed satisfactorily in all cases.

If inadequate feeding is provided, the castings are likely to exhibit a satisfactory outward appearance, but they may have within them shrink cavities that may show up upon machining.

Examine the Castings

In the production of the best aluminum bronze castings, it is an excellent practice to fracture some castings regulary from each pattern or heat as produced, breaking these castings at such points as might possible contain shrinkage cavities. If such cavities are present, the proper corrective measures must be taken immediately to insure the best product of which these alloys are capable.

In general, compositions of aluminum bronze should consist of copper, aluminum and iron with practically no admixture of any of the other element. However, there are a number of alloys on the market in which some nickel is added to the other three elements. That series of aluminum bronzes with a nickel content is being developed and will be discussed later in this series.

Lead has been tried as an additional element in the hope that it would improve the machinability, but results indicate that it reduces the available physical characteristics by making the alloy more brittle, reducing the elongation materially and in many ways affecting the metal in an unsatisfactory way. Presence of tin up to 0.5 per cent has not been found to be detrimental but it is not necessary in the interest of a better product.

Silicon will creep in in microscopical quantities as it is almost invariably an impurity in the aluminum ingots. Silicon, however, does not have any serious effect on these bronzes in small microscopical percentages and it is frequently lost in the process of manufacture by reason of its affinity for oxygen, and consequent oxidation to the form of silicon oxide which is dissolved by the surface scum or dross and thereafter skimmed off. There is no need to use phosphorus or any other element as a deoxidizer since aluminum itself is a strong deoxidizer and reduces the copper oxide the moment it is stirred into the copper.

It will be seen from these remarks regarding presence of other elements that only the purest of raw materials should be used in production of these alloys if best results are to be obtained. Since aluminum is a light metal and copper is much heavier addition of aluminum to the copper must be accompanied by thorough stirring in a vertical motion so as to bring the copper up and push the aluminum down. That will insure a thorough mixing of these two metals that vary so greatly in their specific gravity.

Sam Tour in *Metal Industry Casting Manual*, 1938 recommends practice for making of aluminum bronze as follows: Copper is melted first, to which is added some of the aluminum. As soon as this has reached a well melted condition, the iron is added and then the remainder of the aluminum follows. Upon adding any of the elements to the copper, the bath must be stirred thoroughly each time an element is added and then after it becomes well melted, it should again be stirred well and

(*Concluded on page* 72)

Table VII

Pertinent Data on Selected Group of Elements

Element	Copper	Tin	Lead	Zinc	Aluminum	Iron	Nickel
Chemical symbol	Cu	Sn	Pb	Zn	Al	Fe	Ni
Atomic weight	63.57	118.7	207.22	65.38	26.97	55.84	58.69
Boiling point deg. Fahr.	4259	4100	2948	1661	3272	5430	5252
Density, lb. cu. in.	0.323	0.264	0.409	0.258	0.0975	0.284	0.320
Elastic limit lb. sq. in.	....	200	355	....	....	....	....
Electrical resistivity michrohm-cm.	1.682	11.5	20.65	6.0	2.699	9.8	10.9
Elongation—per cent	58	....	68.6	....	60	43-48	15-35
Hardness—brinell	25	5.2	3	....	16	67	80-125
Linear coefficient of thermal expansion deg. Fahr. x 10^{-6}	9.3	11.12	16.4	18.3	13.3	6.6	7.3
Modulus of elasticity in tension lb. sq. in. x 10^{-6}	16	5.9-7.8	2.56	12.4	10	30	30
Melting point deg. Fahr.	1981	449	621	787	1220	2795	2645
Reduction of area—per cent	73	....	100	....	95	70-77	30-50
Specific gravity	8.94	7.3	11.35	7.14	2.70	7.87	8.85
Tensile strength lb. sq. in.	31790	2000	1609	....	8500	38500	60000-75000
Yield point lb. sq. in.	....	....	714	....	....	19000	20000-30000

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Elementary Foundry Technology [NEW AND REVISED]

A Guide Book for the Apprentice sponsored by the National Founders Association, Chicago

This new and completely revised second edition is a text designed primarily for foundry apprentices and practical students of foundry operations. The text conforms to the requirements for instruction as set up in the minimum standards of four year foundry apprenticeship in the United States. Revised and Edited by Pat Dwyer and Edwin Bremer of The Foundry.

CONTENTS: Substances and Their Structure; Some Physical Properties; Oxidation, Reduction, and Combustion; Force and Motion; Application of Force; Mechanics and Fluids; Iron; Effects of Elements on Iron; The Cupola; Elementary Problems in Steel Foundry Practice; Foundry Sands; Gates and Risers; Molding Machines; Permanent or Long-Life Molds; Glossary; Bibliography.

375 PAGES — 132 ILLUSTRATIONS — 16 TABLES

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(*Concluded from page* 70)

preferably poured into ingots and then the ingots should be remelted for the provision of molten metal for the pouring of castings.

Such practice is adopted commonly by many manufacturers of the alloys. Since the aluminum content is oxidized readily and forms an aluminum oxide film, agitation of the alloy disrupts that film to form dross. Therefore, the bath must be skimmed off thoroughly before pouring and all the metal entering the mold must enter through gates that provide a quiet entrance into the mold that will avoid any agitation or disruption of the aluminum oxide film. If this film is disrupted at any point in the stream entering the mold, it will increase drossing and form dross spots on the casting.

Control of the composition so as to insure an accurate confirmation to formula is extremely important as a variation in the ratio of aluminum to iron, or aluminum to copper, or copper to aluminum plus iron will vary the physical characteristics and vitally influence the response to any subsequent heat treatment. It complicates the heat treatment most thoroughly if the chemical analysis of the casting is not accurately known to be that composition for which the heat treatment is laid down. A variation of heat treatment must be made when the composiion varies. Thus the control of the composition is a vital factor in accurate heat treatments.

Compositions 1*UU*, 1*VV* and 1*WW* are the silicon bronzes, some of which are within the specifications covered by some of the trade names or patented alloys. Therefore, the discussion will be limited to stating that they are a type of composition of silicon with copper in which occasionally some aluminum is present or some tin, developing characteristics that are highly satisfactory with some types of service. Available published data is herewith listed and it will be noted that composition 1*UU* is covered by specification QQC-593 of the Federal specifications board.

In the case of composition 1*UU*, 2½ per cent of iron and 1½ per cent of manganese are permitted under some of the specifications. These compositions are used for many types of service where resistance to corrosion in the presence of certain mediums is a characteristic of importance. The problem of gating and proper provision for shrinkage that has been discussed in connection with aluminum bronze applies quite as emphatically to these compositions since they also shrink a great deal and must be fed properly to insure sound, satisfactory castings.

After discussing the more common commercial combinations of the nonferrous metals and listing the physical characteristics for these commercial compositions, it would seem desirable for the benefit of those referring to the tables and data dealing with these compositions, that a complete list of some of the more common characteristics of the elements themselves would be in order and might be helpful when foundrymen are considering the variations from the standard compositions listed and the probable effect of these variations in compositions. We are, therefore, giving on a preceding page, Table VII dealing with the 7 elements most commonly found in the compositions listed. The information is listed in alphabetical form so that ready reference is facilitated.

This is the seventh article of a series on nonferrous alloys available to foundrymen. Previous articles appeared in the January, February, March, April, May and June issues. The next in the series will be presented in August.

The Editors.

Adventures of Bill

(*Concluded from page* 56)

edge required by the average operator has been reduced to a minimum. The engineering profession has taken hold of the job and set up definite standards which can be controlled. Mechanical equipment has removed nearly all the variable factors incident to the human factor.

"All this is in line with the progress required if the foundry industry is to hold a place in the fiercely competitive industrial race track. Just the same, the rapidly dwindling army of old time skilled mechanics may be pardoned if they experience a nostalgic twinge or two when they look back to the days when they were proud of their trade and proud of the reputation they enjoyed as representatives of the highly specialized branch of the industrial arts.

"Larger and heavier iron castings have been made here and in other countries, but I doubt if any iron casting involved more intricate detail than this statue of Vulcan cast in a southern foundry 35 years ago. The figure was cast in four sections which when fitted and bolted together formed the giant fire god 59 feet high. The head alone is 12 feet high and 10 feet in diameter. This head casting by the way is a particularly creditable piece of work since about 250 drawback cores were required in the construction of the mold. Making these cores, removing them, drying them and then fitting and securing them in place was a job that involved a high degree of skill on the part of the operators. Some parts of the casting were 2 inches thick while other parts were only ¾-inch. Naturally, this condition set up contraction strains which had to be anticipated and provided for to prevent cracking or shrinkage defects. The job was in the foundry four months and what perhaps is still more remarkable, every piece was perfect when the mold was dismantled. Total weight? Oh, approximately 100 tons."

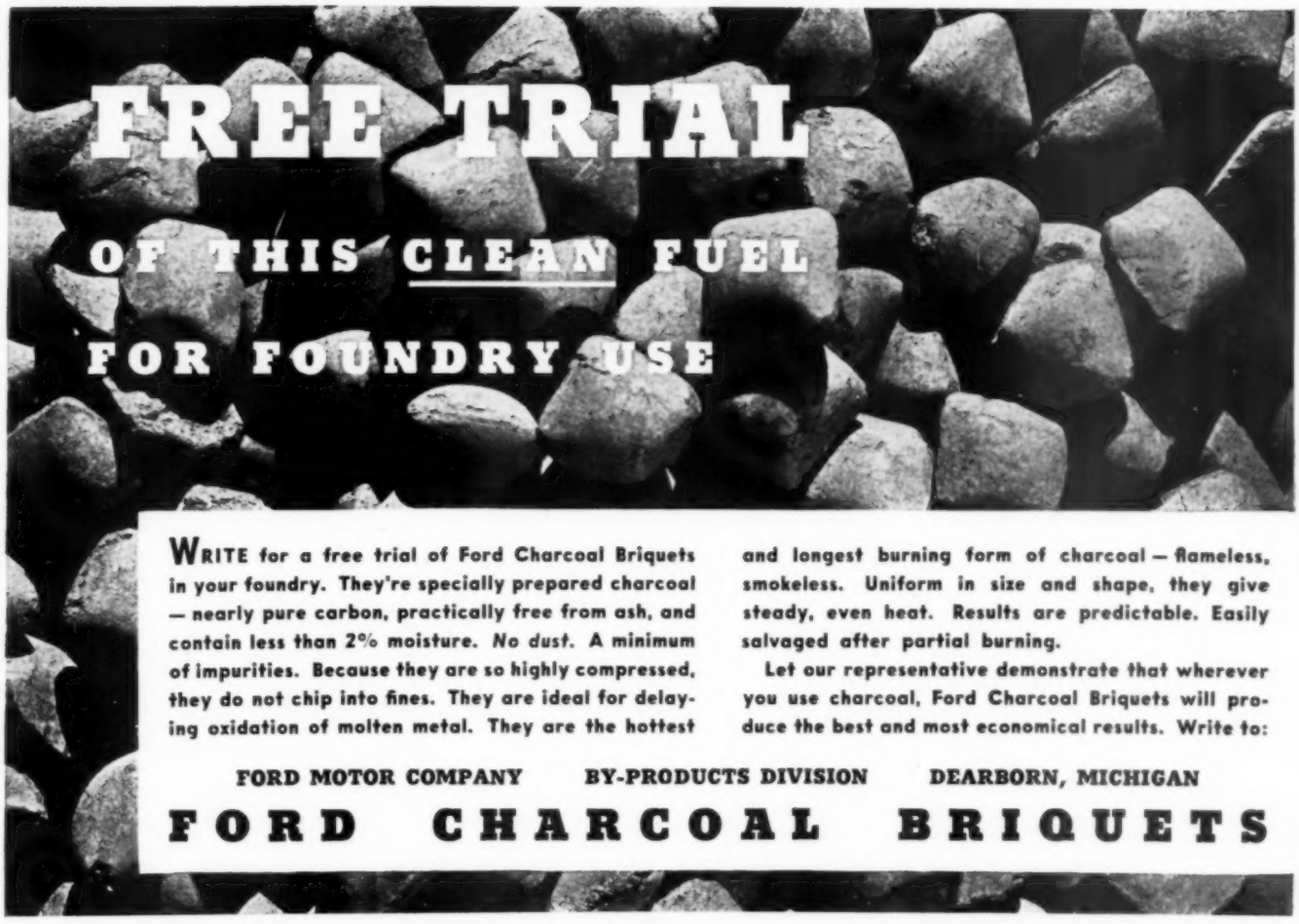
"All pretty solemn stuff," I said. "Was no one present to inject a touch of levity in the four days' proceedings?"

"Plenty of 'em," said Bill. "Plenty of 'em. Here's a clipping a fella handed me one day after we had heard an erudite lecture on the chemical properties of something or other. 'A chemist analyzing that comparatively unknown element, woman, described her as follows: Element, woman. Occurrence: Found wherever man exists. Seldom in free state. With few exceptions the combined state is to be preferred. Physical properties: All colors and sizes. Usually in disguised condition. Face covered by a film of composite material. Boil at nothing and may freeze at any moment. However, melts when properly treated. Very bitter if not well used. Chemical properties: Very active. Possesses great affinity for gold, silver, platinum and precious stones. Violent reaction when left alone. Ability to absorb expensive food at any time. Undissolved by liquids. Turns green when placed beside a better looking specimen. Ages vary rapidly. Fresh variety has great magnetic attraction. Note: Highly explosive when in inexperienced hands'."

Machine Tool Show

The 1939 Machine Tool show will be held in the Public auditorium and underground exhibit hall, Cleveland, Oct. 4 to 13. A series of evening meetings sponsored by the Machine Tool congress will be held in connection with the show. Organizations participating in the Machine Tool congress are: the American Foundrymen's association, American Society of Mechanical Engineers, American Society of Tool Engineers, Associated Machine Tool Dealers, Cleveland Engineering society, National Electrical Manufacturers association, National Foremen's association, National Machine Tool Builders' association, and Society of Automotive Engineers.

Arnold Electric Co., 606 South Twenty-fourth street, Arlington, Va., has been appointed distributor for T. B. Wood's Sons Co., in the Washington territory.



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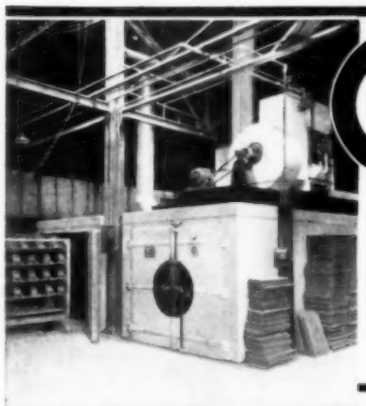

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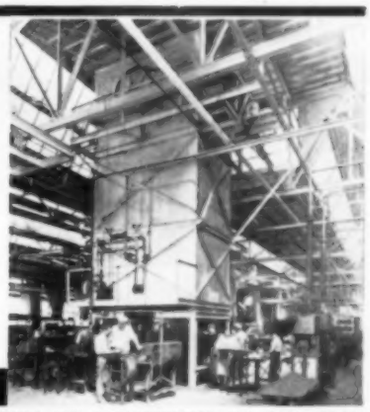

ONE OF A BATTERY OF COLEMAN TOWER OVENS AT THE BENDIX PRODUCTS CORP., SOUTH BEND, IND

Steel Casting Revival

(*Continued from page* 26)

ter suited to the pouring of light, thin-section castings.

Item 4 is the most controversial, but in the author's opinion is substantially correct when standard practices of acid and basic types are being compared. The sluggishness in pouring exhibited by basic electric mild steels in certain conditions of manufacture led to the term *over-reduced*. *Under-oxidized* probably would be more technically correct.

In normal conditions of practice it would appear that steelmaking methods have resolved themselves into a definite order in the minds of steel foundrymen, based on their ability to produce easily poured steel. Heading the list is the converter, and in America the basic-lined electric furnace occupies bottom position. It is significant that the position on the list occupied by any process is in inverse relation to the degree of reducing conditions normal to its use, at any period of the steelmaking process.

The question of the influence of long maintained reducing conditions on the fluidity of steel for castings is no longer treated with skepticism, and inquiry confirms an almost universal avoidance of such furnace conditions. Improvements in steel castings performance, and consequently in their scope of engineering application, due to better knowledge of steelmaking technique for castings, have been considerable, and offer a substantial contribution to the industry by means of metallurgical progress. The subject is extremely live in the United States of America, the steel division of the A. F. A., and the trade organization of the industry, the Steel Founders' Society of America, both devoting special attention to giving it full prominence in committee work and conferences.

Make Casting Fit Job

A bibliography of American literature on steelmaking practice for casting production is presented on page 78.

One of the major effects of increased metallurgical thought on steel casting production has been the growth of the idea of "making the casting to fit the job." In other words, it has been realized that mere thickness changes with a standard material do not even approach a solution of certain difficult service conditions. A study of the conditions, in the light of available metallurgical knowledge, has led to a steady and continuous increase in the use of alloy compositions of many types.

In the earlier days that growth was menaced seriously by a lack of appreciation of the vital importance of suitably allied heat treatment, and foundries, slow to embrace the growing metallurgical significance in alloy content, which did not exist apart from correct heat treatment. Very largely that attitude has disappeared, and reasonably accurate knowledge of the relation is practically industry-wide today. The natural result has been an expansion of the scope of application of the steel casting, and its use in very many cases where previously it was not believed advisable.

Steel foundries of the United States carefully have fostered the low alloy types of steel, which, with correct heat treatment, contain within their range a material highly suitable for almost every engineering application, apart from corrosion or high temperature resistance.

Metallurgist Assisted Progress

The practical utilization of those steels in casting form represents a metallurgical problem with three closely related phases—mass, composition and heat-treatment—and the foundry metallurgist has assisted progress remarkably by realizing and elucidating the correlated effects of all three.

The number of alloy combinations in these low alloy steel castings is today very large, many of them manifesting approximately the same physical properties. Choice, therefore, is often dependent upon individual preference on the part of either the founder or the purchaser. A few of the more popular may be described briefly, as a matter of interest, entirely without prejudice to the many others whose properties are probably just as valuable, but whose inclusion could prolong this section unduly.

Manganese-vanadium castings, containing from 1.2 to 1.5 per cent manganese, and 0.1 to 0.2 per cent vanadium, constitute a valuable member of the group, responding easily to various heat treatments with a wide range of resulting properties, and especially high dynamic values.

Manganese-molybdenum steel is an exceedingly popular one for use in castings in the United States. Response to heat treatment is complete and easily accomplished, and the steel possesses good foundry characteristics. Where design and mass are suitable, that material, in casting form, can be quenched safely in water or oil, and followed by a tempering treatment designed to suit the service intended, results in a casting of high tensile and yield ratio, with excellent ductility and resistance to impact.

Some straight copper steels are in use, but commonly that element is present in combination with at least one other alloying element, such as chromium or molybdenum. Such castings correctly heat treated possess excellent properties, both static and dynamic. They also possess in a high degree good founding qualities, a point of very great importance in view of the difficult and complicated designs commonly encountered today.

Provide Shock Resistance

Nickel steels of varying carbon content are in wide use in cases where great toughness and shock resistance are essential. Nickel in combination with chromium, sometimes with the addition of 0.2 to 0.3 per cent molybdenum, has a firm place in the confidence of many founders, and excels where high strength and toughness are demanded in service. The ternary combination also has a following for high temperature pressure castings, having good creep resistance properties.

Straight carbon-molybdenum steels are being found of increasing value for high temperature and pressure conditions involving creep resistance, and have the added qualities of simplicity in manufacture and good foundry behavior. A material finding an increasing application, particularly in oil refinery work, where often temperature and pressure occur in somewhat corrosive conditions, is the 4 to 6 per cent chromium, 0.5 per cent molybdenum combination. Correctly heat treated, that steel has remarkable physical properties. For casting uses, low carbon is a distinct advantage, and rarely exceeds 0.2 to 0.25 per cent, great strength being conferred by the alloy content.

A representative set of physical properties appears in Table I, and it is of added interest to note that in the case quoted an impact specification at 25 degrees Fahr. below zero was imposed. The treatment required to break down thoroughly the cast structure of that material is of great importance in such a case, as it was found that high static qualities, even the possession of such elongation and reduction of area as 32 per cent and 63 per cent respectively, represented no guarantee of successfully meeting impact specifications at subzero temperatures. As a matter of fact, almost every steel used in worked form finds its counterpart in use for steel castings in the United States today, and the en-

(*Continued on page* 77)

ADVERTISING PAGES REMOVED

(*Continued from page* 74)

gineer has a wide choice of types to meet any service conditions.

Chrome-molybdenum steels of varying carbon content, and possessing good resistance to abrasion, and manganese steel of the Hadfield type, where service conditions involve the necessary work hardening surface distortion, are produced in large quantities. Higher alloys for heat and corrosion resistance are all available in casting form, and constitute a growing branch of the industry. In some plants, many of the alloys are produced in centrifugally spun molds, with advantages of appearance and soundness where design is suitable.

This section of the paper should not be concluded without reference to the series of Ford alloys, classified as steels, some containing a high carbon content, which in the presence of silicon as high as 1.10 per cent causes these materials to be graphitic in type, but possessing appreciable ductility after suitable heat treatment. Practically all are copper bearing, in amounts from 0.5 to 2 per cent and some also contain chromium. Introduced originally for crank shaft manufacture as sand castings, their application has been rapidly extended, very great quantities now being produced both at the Ford plant and by other suppliers.

Utilize Steel Castings

Many interesting details were given in a recent paper by Mr. McCarroll of the Ford plant at Dearborn, Mich., presented in THE FOUNDRY for October 1938. There is little doubt but that the increasing use of alloy content in an intelligent effort to meet varying service demands has exerted a great influence on the possibilities of utilizing steel castings to a greater extent than in the past.

Originally, the recommendation of using alloy steels was accompanied by an insistence upon the possibility of decreasing weight by so doing, in many cases this being fallacious as an argument, as it often happens that rigidity has an importance even higher than mere unit strength. Whilst in many cases some saving in weight can be achieved advantageously on existing castings, yet in an even greater number, the sounder argument in support of alloy compositions is the re-establishing of safety margins without adding to weight, in engineering applications where progress demands higher speeds, heavier loads, higher pressures, higher temperatures and so on, each of which rapidly absorbs the available margin of straight carbon steels.

A study of service conditions almost always can result in a foundry recommendation of a suitable alloy steel, the special characteristics of which have a definite value in each particular case. Such work is essentially metallurgical, and represents an incontrovertible proof of the value of metallurgical knowledge to the industry.

A bibliography of American literature on alloy steel castings is presented on page 78.

Although emphasis is often placed upon the undeniable fact that recourse to alloy composition should be taken only when service conditions impose loads or strains outside the capacity of carbon steels to bear safely, yet it is true to say that advantage of heat treatment applied to carbon steel castings has only been taken in any considerable degree since alloy content forced the realization of the great benefits derivable from correct heat treatments of various types.

Some Users Are Prejudiced

Even today, it is doubtful whether such advantage is fully taken, often owing to prejudice on the part of some users, fear of severe treatment causing trouble, or the limiting effect of certain specifications which lag behind metallurgical progress. Steel founders have permitted the idea to remain in the minds of engineering users of their product that in some strange way unworked, cast-to-shape steel articles do not respond in a full degree to more advanced methods of heat treatment, an idea which is without foundation.

It is assumed that the absence of mechanical work of a structure-affecting type, such as rolling or forging, inflicts a form of inherent penalty on the steel casting, slowing or preventing the structural modifications brought about by various forms of treatment. In view of the physical properties daily being produced in a number of American foundries, it is difficult to see why that idea should not long ago have been removed. As a typical instance, the author recently was informed of the successful production of quite intricate castings, weighing about one and a half tons each to the following specifications: Maximum stress, 40 tons per square inch; yield point, 26.8 tons per square inch; elongation, 30 per cent; reduction of area, 60 per cent; Charpy impact, 30 foot-pounds.

Castings Water Quenched

Not very long ago the liquid quenching of such castings would have been looked upon as almost a foolish procedure; but any foundry metallurgist knows that such a specification can be met only by the use of that type of heat treatment. In the author's plant, low alloy castings have been water-quenched in very large numbers, and, on occasions, individual castings weighing over 1½ tons have been given a water-quench and temper treatment quite satisfactorily.

A high temperature breakdown treatment is indispensable if the high standard is to be attained, and on that account it has become common to fix the heat treatment temperatures about as follows: Anneal or normalize at 926 to 1010 degrees Cent.; normalize or liquid quench, 815 to 870 degrees Cent.; temper at

Eastern Foundry Honors Old Employes

THIRD annual service banquet of the Farrel-Birmingham Co. Inc., Ansonia, was held June 6 with 130 men who have been with the company over 25 years as guests of honor. High spot of the evening was the presentation to Edwin Van Riper of a diamond-studded watch charm in recognition of his completion of 60 years of service. He also was presented with a gold watch commemorating 50 years service to take the place of one awarded to him 10 years ago, which was stolen. A 50-year watch was presented to James Dunn while John Walter received a 25-year service pin. President N. W. Pickering was toastmaster, the service awards were presented by Franklin Farrel Jr., and the speaker of the evening was Igor Sikorsky, aviation expert. Seated at the table in the illustration from left to right are: Franklin Farrel Jr., Igor Sikorsky, N. W. Pickering, and Edwin Van Riper.

a temperature to suit the intended purpose.

By that means the cast structure is broken down thoroughly, and on that account the normalizing or quenching operation can be carried out from a lower temperature, giving an opportunity for the obtaining of the finest microstructure and the best combination of physical properties.

At the Western Metals congress held in Los Angeles in 1938, the author presented a paper intended to show the response of sand cast steel to varying types of heat treatment. Four types of steel were studied, three of them plain carbon and one a low alloy steel of a manganese molybdenum type.

Every care was taken to avoid variables, both in pouring and solidification, and after cooling, and a fixed schedule of thermal treatments was used for all bars. The bars were cast as integral castings, weighing over 70 pounds each, so as to eliminate the possible reproach of small, separately cast test coupons.

All the Bars Were Perfect

After treatment, all bars were machined and tested for the following properties: Tensile strength; yield point, elongation; reduction of area; cold bend; scleroscope hardness; brinell hardness and Charpy impact, (standard keyhole notch). In all cases the response to treatment was perfect, and not in any one case had a bar to be rejected or replaced for any defect whatsoever.

The heat treated test results were of a standard quite equal to many works steels; the impact results in particular were of an order signifying excellent engineering properties. Tensile strengths ranged from 67,000 pounds per square inch in the annealed condition, to 130,000 pounds per square inch in the quenched and tempered condition. No relationship between impact properties and the results of the static test could be determined definitely, it being very apparent, however, that annealing was of very little value in the development of shock resisting qualities. In the case of the carbon steels, straight normalizing resulted in an increase of over 50 per cent in Charpy impact value as compared with the annealed samples of the same steels.

A significant feature was that water quenching, both in the case of the carbon steels and the low alloy steel, followed by a high tempering designed to produce a tensile strength about equal to that in the annealed sample, resulted in Charpy values, in the quenched and tempered samples, up to two and a half times those of the annealed samples of the same steels. Hardness being practically identical, it is evident that, with practically no increase in machining difficulty, special applications demanding great shock resistance can be cared for in this manner.

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Inclusions—Their Effect, Solubility and Control in Cast Steel, by C. E. Sims and G. A. Lillieqvist, A.I.M.E., February, 1932.

Some Factors Affecting the Cleanliness of Steel Castings, by C. H. Herty Jr., C. F. Christopher and M. W. Lightner, A.F.A. reprint No. 32-4, May, 1932.

Points to Causes of Porosity, by R. A. Bull, THE FOUNDRY, January, 1935.

Preparation of Steel To Avoid Porosity in Castings, by C. E. Sims, *Transactions*, A.F.A., 1934.

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Better Steel Castings Reflected in Specifications, by David Zuege, *Metal Progress*, February, 1934.

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Ford's New Facilities for Casting Alloy Steels, *The Iron Age*, April 30, 1936.

Ford Alloy Castings, by R. H. McCarroll and J. L. McCloud, *Metal Progress*, August, 1936.

Heat Resisting Castings, Cr-Ni-Fe Alloys, by J. D. Corfield, *Metal Progress*, October, 1936.

Strong Steel Castings Ride the Rails, by Raymond L. Collier, *Metal Progress*, February, 1937.

Alloy Steels Designed for Specific Uses, by Vincent T. Malcolm, THE FOUNDRY, July, August, September, 1938.

Progress in Automotive Steel Castings, by R. H. McCarroll, THE FOUNDRY, October, 1938.

Publish Brochure

Leading research and testing laboratories, joined together to form the American Council of Commercial Laboratories, have issued a 12-page brochure describing the efforts and aims of the organization, and giving a list of the charter members. Copies of the brochure may be obtained from D. E. Douty, secretary, 1415 Park avenue, Hoboken, N. J.

Buffalo Foundry & Machine Co., Buffalo, has opened a branch office at 726 Keith building, Cleveland, in charge of Malcolm S. Adler.

Book Review

Microscope in Elementary Cast Iron Metallurgy, by Roy M. Allen, brown cloth waterproof binding, 160 pages, 6 x 9 inches, 72 illustrations, published by the American Foundrymen's association, and supplied by THE FOUNDRY, Cleveland, for $3 and in Europe by the Penton Publishing Co. Ltd., London.

This book is an enlargement of the material presented at a series of lectures at the 1939 Cincinnati convention of the A.F.A. The text is written in simple language that can be understood easily by both the novice and the expert. The author has attempted to show the practical man there is nothing particularly difficult about the fundamentals of metallurgy, the microscope and interpretation of photomicrographs.

The first section deals with the value of the microscope to the gray iron foundryman and the fundamentals of physical iron metallurgy. The author then embarks on an explanation of the behavior of sulphur and phosphorus in cast iron, how these elements may be identified in the microstructure, and their effects on the properties of the iron. The fourth chapter deals with what the author terms special irons, such as white, chilled, malleable, and alloy cast iron, explaining variations in properties by use of photomicrographs.

In the next section, the author explains the value and use of equilibrium diagrams. He begins with an explanation of simple binary diagrams and then proceeds to show how the same principles can be applied to the more complicated diagrams, particularly the iron-iron carbide diagram.

In the final chapter, the microscope and the technique of its use are discussed. Various parts of the microscope and the function each performs are explained. In addition, technique in focussing, taking the photomicrograph, photographic processes, photographic papers, etching reagents and sample preparations are discussed. Various types of equipment for grinding, polishing and photographing metal samples are shown.

Report Available

"Discussion of Industrial Accidents and Diseases," a report of the 1928 convention of the International Association of Industrial Accident Boards and Commissions, recently has been published by the United States department of labor, division of labor standards. This bulletin, which contains 204 pages may be secured through the superintendent of documents, Washington, for 30 cents.

Pullman Conversation

"Hello Jim! It was a good convention, wasn't it?"

"Yes, Sam. I certainly learned a lot, not only at the meetings, but in talking with the boys. For instance, every second or third fellow I met had something good to say about that CLEARFIELD MIXER. There's one thing I'm going to look into."

"Why don't you, Jim? We got one two months ago and it's doing a whale of a job. Foreman says it gives him a lot nicer sand and I notice our casting losses have been going right down."

"That's mighty interesting Sam. Thanks for the tip. I won't forget it."

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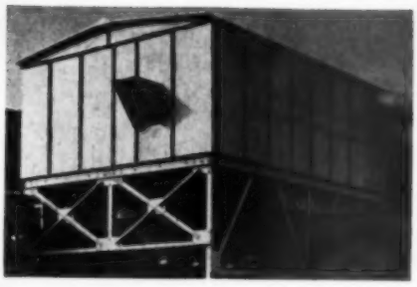

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BLAST CLEANING BARRELS AND ROOMS

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French Award Medal

(*Continued from page* 27)

ing schools and having technical knowledge, but little practical experience. This was the first specialized school of foundry organized in Europe, about 10 years ago, thanks to the efforts of the late E. V. Ronceray and the financial assistance given by the government and by the syndicate of foundry employers. The school now is operating with complete success, and students coming from almost every industrial country of Europe have obtained their degrees as well as the native students of France.

The next paper, given by M. Andre, of Compagnie des Forges et Acieries de la Marine et d'Homecourt, dealt with "Co-operation Between the Designing Office and the Foundry" and treated mainly the methods to be employed in designing parts to be made into castings. The author pointed out that there is still a considerable lack of co-operation between the designer and the molder, and that it is essential not only that there should be a constant liaison between the two offices, but also that the designer of parts to be made into castings should have complete knowledge of fundamental principles of casting. Various examples were given, bringing out the most common mistakes occurring in design.

P. Ageron, manager of the foundries of Foug of Societe des Hauts-Fourneaux et Fonderies de Pont-a-Mousson, read a paper entitled: "Duties of the Management in Preventing Accidents From the Point of View of the Psychology of the Workmen." In this paper the author points out it is essential that management of a foundry should be conscious of its social duties, one of the essential features of which is the avoidance of accidents. He also emphasizes the necessity for all those who are responsible for the management and the overseeing of foundries to co-operate with this end in view.

Causes of accidents are listed under various headings, such as technical causes, physical causes and psychological causes, the latter being those mostly developed in the paper. These include: (a) A wrong professional adaptation, inasmuch as certain workmen have not the necessary qualifications to fulfill the requirements of their profession; (b) permanent deficiency on the part of the individual; (c) inattention, unskilfulness or lack of goodwill; (d) undue haste; (e) lack of proper dressing in cases of light injuries. Various remedies relative to these accidents are suggested.

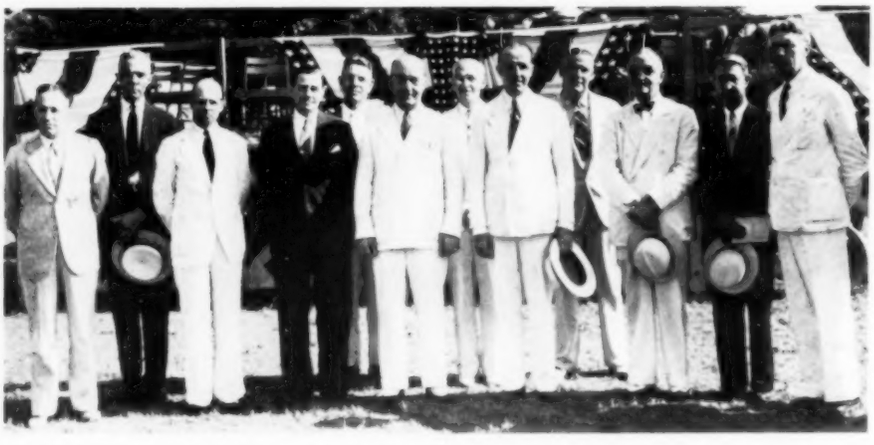
The last paper of the morning session was on "Lighting of Foundries and Its Eventual Use in Passive Defence," by Armand Vallat, of Societe pour le Perfectionnement de l'Eclairage. As regards normal industrial lighting, the author stated that in foundries satisfactory results are given by a scheme of general lighting obtained by concentrated lights placed along the longitudinal axis of the bay, completed by other lights placed in the corners of the foundry and along the walls. These lights can be equipped with ordinary electric lamps or with sodium or mercury vapor lamps, their object being mainly to give general lighting in the foundry. Additional lighting must be provided for individual work near the molding stations and in other places where the man in charge must have a distinct view of his work. The author added that in the case of war, normal lighting must be reduced, but sufficient lighting must be left to enable work to be carried on. Furthermore, special lamps and reflectors must be branched on independent circuits to obtain lighting in case the premises have to be evacuated.

The afternoon session was presided over by J. Leonard, past-president of the Belgian foundry technical association, J. Lobstein, president, and A. Damour, past-president, of the French foundry technical association.

The first paper, by Y. Letort, technical director of the French association of refractory products, was on "Process of Corrosion in Refractory Linings of the Cupola." The paper describes a series of experiments made by the author to show the occurrence of corrosion on refractory linings by the action of the slag. These experiments were conducted in the laboratory and have not yet been confirmed by practical experience, but they do throw a light on the problem. They indicate that refractories having a magnesia base show exceptional resistance to corrosion; silica-base refractories show unequal qualities, but some of them do give excellent results, and further investigations must be made in their physical properties. Progress

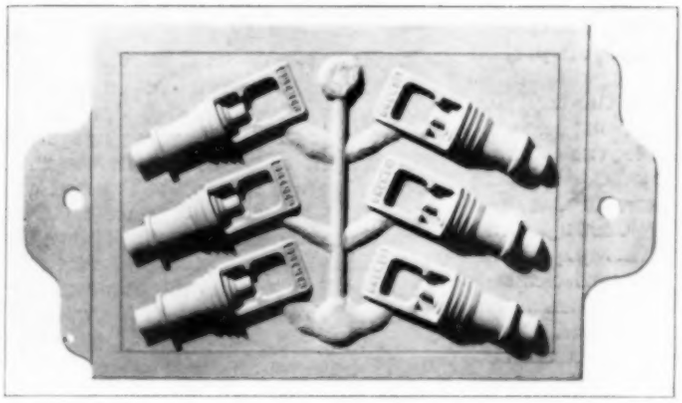
(*Concluded on page* 82)

Hagerstown Dedicates Pangborn Park



CITY of Hagerstown, Md., officially dedicated Pangborn Public park on Saturday afternoon, June 10. The park site was donated to the city by Thomas W. Pangborn and John C. Pangborn of the Pangborn Corp. Sponsored by the city and with the co-operation of WPA, the project is a beauty spot of which any town might well be proud. In addition to formal sunken gardens planted with long banks of radiant flowers arranged for continuing rotation of bloom, water fountain and reflecting pool, there are two baseball diamonds, two doubles tennis courts, illuminated horseshoe pitching courts and extensive children's playground with swings, merry-go-rounds, slides, etc.

Reading from left to right in the above illustration taken at the dedication program are: Francis Petrott, secretary of state, Maryland; Rev. Scott R. Wagner; F. W. Springer, area supervisor, WPA; Francis H. Dryden, Maryland WPA administrator; Charles Bornfield, project superivsor, WPA; Thomas W. Pangborn, president, Pangborn Corp.; Joseph I. Lyon, city engineer, Hagerstown; Richard H. Sweeney, mayor, Hagerstown; L. L. Stouffer, park board of Hagerstown; John B. Pangborn, vice president, Pangborn Corp.; W. Keller Nigh, councilman of Hagerstown; J. B. Ferguson, president of chamber of commerce and chairman of dedication program.



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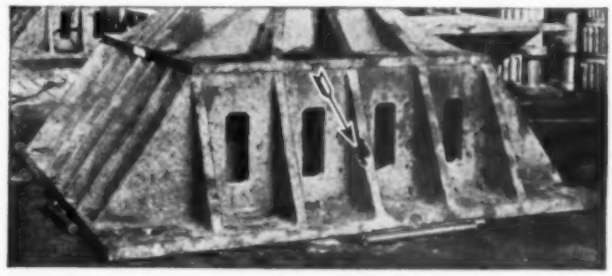

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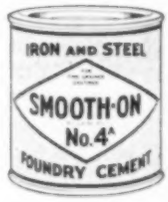

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(*Concluded from page* 80)

also has been made in the development of alumina-base refractories, both from the point of view of chemical composition and method of manufacture.

Col. G. Dupuy, engineer in charge of the manufacture of armaments, in his paper on "Radiographic Examination of Steel Castings" describes present methods of examination of castings by means of x-rays. He shows that this method of control enables certain castings to be scrapped immediately following their examination, thus saving many hours of machining before internal defects can be detected. He also points out that this method enables the founder to perfect certain methods of molding or casting, with a considerable saving of time and a large reduction of discarded castings. Furthermore, x-ray examination contributes to the study of internal stresses and their influence in the mechanical qualities of steel castings.

The next paper, by L. F. Girardet, past-president of the French foundry technical association and foundry proprietor at Saint-Die (Vosges) embodies result of a recent investigation made by the author on "The Cupola and the Melting of Cast Iron." The paper emphasizes the fact that the cupola is the melting furnace which gives the most economical means of melting iron and the largest production in the minimum amount of time. From his investigation, the author establishes four main principles from which he deduces the correct working and control of a cupola.

The first principle establishes that the region of maximum temperature in the cupola is above the tuyeres and at a distance vertically equal to ten times the mean diameter of the pieces of coke.

The second principle states that there is no more oxygen in the gases that escape from that region of maximum temperature. From that region the oxygen is replaced by carbon dioxide, volume for volume.

The third principle establishes that carbon dioxide released from the maximum temperature region reacts on the heated carbon (coke) as it ascends toward the throat of the cupola and gives carbon-monoxide.

The fourth principle, established by Seigle in 1918, states that in the gases escaping from the cupola there is a definite relation between the proportions of all the component gases.

The last paper, by J. Challansonnet, of Societe Marmet et Vonin, was on "The Evolution of Alloys Used for Bearings." The author described the latest types of bearing alloys, but, unfortunately, was unable to disclose certain information of interest on account of professional secrecy.

The lecture given on the day preceding the convention in conjunction with the Societe des Chimie Industrielle was by G. Delbart, of Anciens Etablissements Cail, the title being: "Steel Castings and Forged Steel." In this paper the author compares characteristics and uses of both methods of manufacturing finished steel products, and states that casting lends itself better than forging to obtaining pieces of a complicated shape, and that the developments of steel castings since 1880, when Pourcel succeeded in casting steel without blowholes, have continued to this day, with continuous progress, so that it now is possible to use steel castings for the manufacture of armament plates. The paper gives a comparison of the two methods of manufacture from the point of view of the metallurgist, and shows the advantages and drawbacks of each method.

Book Review

Practical Handbook of the Entire Welding Technique (Praktisches Handbuch der gesamten Schweisstechnik), by Schimple-Horn, fabrikoid, 300 pages, 6 x 9 inches, published by Julius Springer, Berlin, Germany, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co. Ltd., London.

This book, which is in German, is the third edition of Part I on the practical phases of welding technique, and is concerned with gas welding and cutting technique. The book is divided into eight chapters of which the introduction discusses generalities of welding and gas welding, special new welding processes, review of arrangement of gas welding plants, important properties of weldable metals. Chapter II deals with specific equipment for gas welding and describes welding gases, and welding accessories. Technique of gas welding is described in detail in Chapter III while soldering with a welding torch is covered in the next chapter. Torch cutting is dealt with in Chapter V, and the advantages of welded seams and their testing is described in Chapter VI. Chapters VII and VIII discuss capacities and costs of gas welding processes, and advancement of welding technique.

Link-Belt Co., Dallas, Tex., is building a new office and warehouse on Latimer street at the intersection of Pierce street. The new building is 105½ feet wide and 225 feet long. E. G. Wendell is district manager.

Ford Ring Gears

(*Concluded from page* 23)

are pivoted in the middle. A weight is located on one end and a hook on the other. When the die spins, the weight flies out and drives the hook onto a ledge on the top half of the die, locking it into place securely. When the die ceases to spin, the weight falls down, automatically releasing the die for the removal of the gear blank.

As now set up, one man loads the cores into the dies and sets in position the top half of die, another pours the molten steel, and a third removes the die top and gear blank. Approximately 4 minutes is the time for one complete revolution of the turntable. Dies are spun at 190 revolutions per minute in the case of the truck ring gear. For smaller car ring gear blank, the speed is 325 revolutions per minute and for the transmission cluster gear with its still smaller perimeter, the speed is 490 revolutions per minute. Adoption of these speeds was the result of many tests. Operation of the centrifugal machine began with much higher speeds, but it was found that the lower speeds previously mentioned give best results with a minimum of strain on the equipment.

The centrifugally cast gears were subjected to searching laboratory tests and to hundreds of thousands of miles of service before being accepted for production.

"We had been working for nearly a year when the first story was published," Mr. McCarroll said. "We knew then the centrifugal system was faster and much simpler than forging, that the gears were stronger, and that dimensions could be held much closer. After that it was simply a question of finding and standardizing on the best possible procedure and of designing the necessary production equipment."

International Nickel Co. Inc., has announced the establishment of a new development and research field office located at 67 Wall street, New York. The new office is under the direction of J. W. Sands. Its main function will be to promote the use of nickel alloy steels, nickel cast irons and the use of nickel nonferrous alloys. The territory covered by this office includes Metropolitan New York, Long Island, New Jersey; Pennsylvania, east of Williamsport, Harrisburg, York; Delaware, Maryland, Virginia and the District of Columbia. This is the sixth office opened by the Development and Research division of the company. Other offices are located in Los Angeles, Chicago, Detroit, Hartford, and Pittsburgh.

ADVERTISING PAGES REMOVED

Among Detroit Foundries

(*Concluded from page* 28)

bearing assemblies would appear to be a rather important innovation and one which should bear careful watching. Ford's success in adapting castings to an ever-widening range of automotive parts is becoming too well-known to bear repetition here. Apparently when Ford engineers set out to accomplish something, no obstacle is too great to surmount.

One question has been suggested in regard to bearing races cast centrifugally. Optimum surface properties would be desired on the inner side of the outer race and inasmuch as optimum properties of a centrifugal casting are found on the outer periphery, some sacrifice might have to be made on this score. As far as the inner race is concerned, the best surface condition of a centrifugally cast piece would be on the outside where it is desired.

Duplex the Iron

Brake drums produced by centrifugally casting iron on the inner side of a pressed steel backing (THE FOUNDRY for June, page 30) shortly will be available from Kelsey-Hayes Wheel Co., Detroit. that organization makes large quantities of brake drums for several automotive companies by sand casting (THE FOUNDRY for April, page 35), and for several months has been carrying forward experimental work on the centrifugal process. An equipment program involving close to $250,000 has been launched and will include, in addition to the necessary spinners and turntable units, these to be built by the company, several rocking electric furnaces for duplexing cupola iron.

How the Kelsey process will differ from that used by Centrifugal Fusing Co. in Lansing is not yet known. From meager advance information, it appears the two methods will be quite similar. When Kelsey gets into full production on the centrifugally cast drums it will mean the majority of automotive brake drums will be of that variety. One report is to the effect Ford will change to the composite type of drum for 1940 models and will split requirements between Kelsey and Centrifugal Fusing.

Incidentally, attention is called to an error in the detailed report of operations at Centrifugal Fusing in the June issue. On page 102, ideal hardness of the cast surface of the drum was given as 89-98 Rockwell C. This should have been Rockwell B. Further inquiry on the type of flux used on the steel bands before the iron is cast on them develops the information that this material is a mixture of 70 per cent soda ash and 30 per cent borax ash with sufficient water to produce a suitable consistency for spraying.

A number of foreign visitors have been received by local foundrymen in recent weeks. One party from Australia included Eric Fleming, managing director of the Australian Sheet Metal Works Ltd., Thebarton, producer of cast aluminum, brass and iron for plumbing fixtures, enamel ware and the like. With him on a round-the-world trip was his assistant R. I. Hocking. They sailed for England June 21.

Also stopping off in Detroit on a jaunt through a number of foundries in the United States was John J. Hyndes, of Metters Ltd., Sydney, Australia.

Visitors to the Pontiac foundry recently included Dr. Walter L. Marcus, Rudolph Homberger and Arnold H. Buell of the George Fisher Steel & Iron Works, Schaffhausen, Switzerland, steel founder and machine tool builder, who were surveying production methods in American plants on a several weeks' tour.

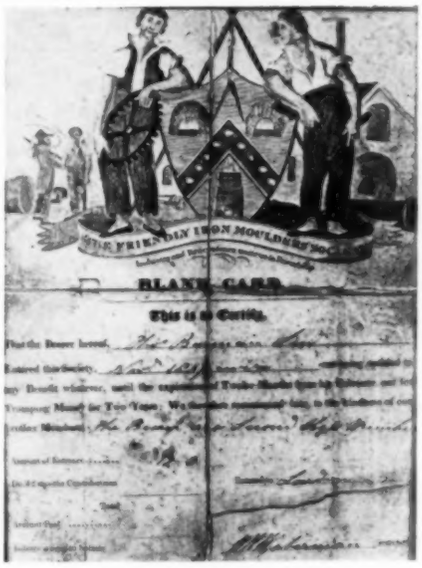
Produces Magnesium Castings

Plant of Magnesium Fabricators Inc., Adrian, Mich., a division of the Bohn Aluminum & Brass Corp. has been operating steadily since its opening last fall, supplying magnesium alloy sand castings to aircraft engine builders, as well as a variety of other parts for builders of portable tools, foundry equipment and the like. Under construction now is a 40 by 80 foot addition to the plant for metal and pattern storage, to make way for installation of a permanent mold casting department in the present building.

Originally designed as more or less of a pilot plant, this division has been accorded a gratifying amount of new business in magnesium castings, and the future looks particularly bright. One of the latest parts to be received is a quadrant arm for the new Ford tractor, which will be a permanent mold casting. It emphasizes the pains which Ford is taking in this new unit to cut out dead weight to a minimum.

Detailed description of operations in the plant of Magnesium Fabricators Inc., is scheduled to appear in an early issue of THE FOUNDRY.

Friendly Molders



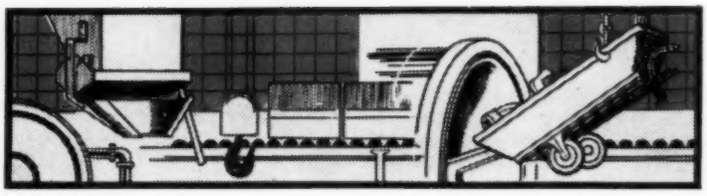
*THE accompanying illustration is a reproduction of the card issued to members of the Friendly Iron Moulders society in England 100 years ago. The original was issued to Thomas Burman, grandfather of George A. Burman, Detroit, through whose courtesy the illustration is presented. As with many British craftsmen, grandfather, sons and grandsons followed the same trade. Several members of the Burman family have played prominent parts in the foundry industry in this country. Inscription under the figures near the top reads: The Friendly Iron Moulders society, with a subhead: Industry and Benevolence Unite us in Friendship. The remainder of the text reads: This is to certify that the bearer hereof Thos. Burman, Sen'r entered this society Nov. 1837, not being entitled to any benefit whatever until the expiration of Twelve Months from his entrance, nor for tramping money for two years. We therefore recommend him to the kindness of our brother members. The bearer is a second class member. Amount of entrance 12 shillings. Entered in London. W. H. Waterman, secretary. * * * The artist appears to have drawn freely on his imagination in the decorative heading, the clothing and shoes of the molders, the pattern in the hands of the man at the left and the tools in the hands of the negligent gentleman at the right.*

Moves Office

Roots-Connersville Blower Corp., Connersville, Ind., has moved its Chicago office from 140 South Dearborn street to Room 1027 Peoples Gas building, 122 South Michigan avenue. There will be no change in personnel, William Townsend being district manager and James T. Sutliff, sales engineer.

Independent Pneumatic Tool Co., Chicago, recently opened a branch office at 1544 Broadway, Denver, charge of C. A. Turnquist.

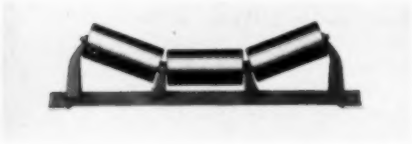
NEW EQUIPMENT . . .



AND SUPPLIES

Belt Idler

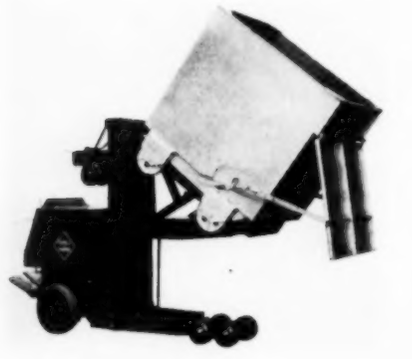
C. O. Bartlett & Snow, 6200 Harvard avenue, Cleveland, recently has developed a belt idler, shown in the accompanying illustration. These idlers have self-cleaning bases, and support brackets are assembled in



jigs to assure proper alignment and correct spacing. Slotted holes are provided to permit slight adjustment in aligning the belt. Idler rolls are machine faced on ends, and pressed on shoulders of cast iron roll ends with rounded outer edges. Antifriction bearings are protected with labyrinth grease seals and a through grease tube is provided from one bearing to the other.

Tilting Truck

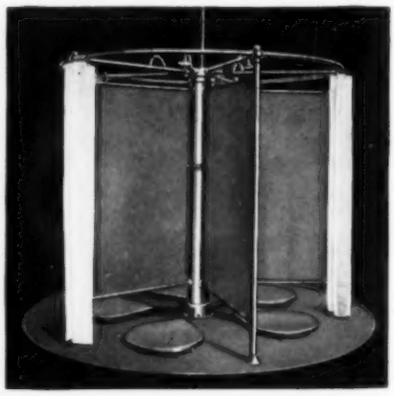
Elwell-Parker Electric Co., 4205 St. Clair avenue, Cleveland announces a tilting type truck with a rated capacity of 10,000 pounds, as shown in the accompanying illustration. The compensating rocket type trail axle has steering levers above the axle for greater road clearance and accessibility. Rods cannot drop off ball and levers. The power plant is a 500 per cent over load and high



torque motor direct connected to free coasting worm and wheel. The controller is electrically interlocked with a mill type magnetic contactor. The angle body is locked on the platform where steady rocking action is under control of the operator. Dumping may be at any height within range of the platform. Truck is equipped with regenerative or ampere return lowering feature and dynamic brake for speed control on ramps and other inclined surfaces.

Group Shower

Bradley Washfountain Co., North Twenty-second and West Michigan streets, Milwaukee has developed a group shower bath for industrial



plants and other institutions designed to eliminate the waste of water usually present under shower bath installations. Water is turned on automatically when the bather steps on the treadle platform, and stops automatically when he steps off. Pretempered water only is used thus assuring complete safety and reducing water consumption.

Portable Crane

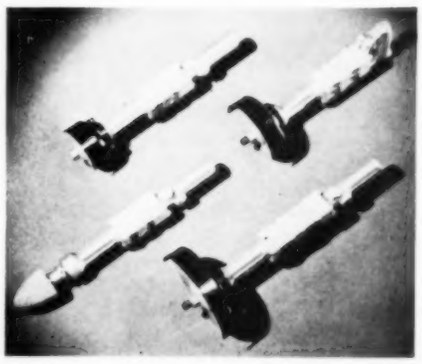
Barrett-Cravens Co., 3255 West Thirtieth street, Chicago, announces a new portable shop crane to be operated either electrically or by hand. Shown in the accompanying illustration, the crane, with fixed or revolving boom is made in several

sizes with capacities ranging from 500 to 5000 pounds. With any lifting height desired it is stated that each crane is custom made to meet any customer's requirements. Boom uprights can be made rigid, hinged or telescoping to negotiate low overhead clearances. The crane is mounted on roller bearing wheels to facilitate easy movement loaded or unloaded. In lifting or lowering a load the front wheels are raised so that members supporting the uprights rest on the floor to insure a firm footing.

Air Grinders

Rotor Tool Co., 17325 Euclid avenue, Cleveland, announces a new air grinder in four sizes as shown in the accompanying illustration, the grinder is built around a new twin cylinder air motor. The smallest for cone and 4-inch wheels

(*Continued on page* 88)



THE SIMPLICITY PORTABLE SAND UNIT

SCREENS, MIXES AERATES AND FLUFFS IN ONE OPERATION

The Rapid Increase in the Number of Simplicity Installations is the Best Proof of the Value of Simplicity Shake-outs and Sand Units in Your Own Plant.

Install a guaranteed unit, built by a company with a real background of experience.

SIMPLICITY ENGINEERING COMPANY
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● Every Day our laboratory checks Lawco Bond for physical properties—Green Compression, Green Shear and Dry Compression.

Every shipment is screen tested for fineness.

Lawco Bond is the better Bond Clay.

Agents in Detroit, Chicago, Milwaukee, Buffalo, Columbus, Youngstown and Hamilton, Ont.

Write us for samples and information.

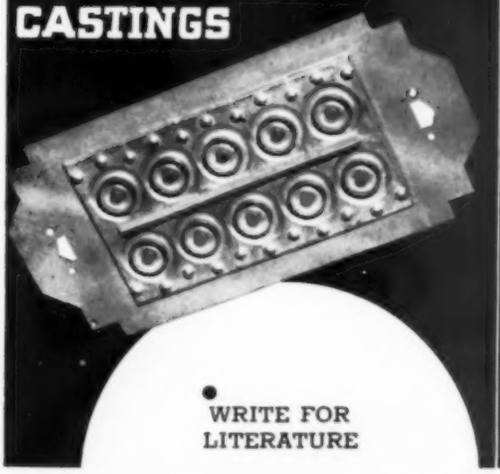
LAWCO BOND

THE LAWRENCE CLAY COMPANY
JACKSON, OHIO

Mines and Mills—Lawco, Ohio

SCIENTIFIC · MATCH PLATES · Pressure Cast

for **ACCURATE CASTINGS**



● WRITE FOR LITERATURE

You **GET**
Accurate Partings,
True Reproductions,
Lower Pattern Costs.

You **SAVE**
Expensive Pattern Duplication,
Excessive Cleaning Costs.

You **AVOID**
Center Shrinks,
Draws at Parting.

The SCIENTIFIC CAST PRODUCTS Corp.
1388-1392 E. 40th St., CLEVELAND, O.
505-507 S. Western Ave., CHICAGO, ILL.

(*Continued from page 86*)

weighs 8¼ pounds. The second size for 4 and 6-inch wheels weighs 8¼ pounds. The third size for heavy duty 6-inch wheels weighs 9¾ pounds. The largest size for heavy duty 8-inch wheels weighs 11¼ pounds. New features include rotors, double life end plates, twin cylinders, center bearing section, positive lubrication and multiport safety balanced governor.

Claims for the new device include high speed under load, unusually light weight, low air consumption, low maintenance cost, safety. The grinders are available with three types of handles. In addition to the construction features the manufacturer points to the interchangeability of parts on all four sizes. It is claimed that the interchangeability feature will reduce repair stocks and cost of maintenance for manufacturers operating 2¾, 4, 6 and 8-inch grinders.

Bin Unit

Noggle Products Co., Ann Arbor, Mich., has placed on the market a revolving assembly of steel bins, shown in the accompanying illustration, and designed for holding a wide miscellany of small parts, nuts, bolts, washers, screws, shims, gaskets, etc. A ticket or sample part is attached to the front of each drawer. It is claimed that this compact revolving unit is a time saver in the shop or a merchandising mover on the sales counter. The unit contains 24 bins 3 x 3 x 2½ inches, or 24 bins 4 x 4 x 3 inches. In either model, a double width bin may be substituted for any pair of single bins. The device is 26 gage steel, spot welded and finished in green.

Skimming Bar

Chicago Mfg. & Distributing Co., 1928 West Forty-sixth street, Chicago, has developed a water cooled skimming bar intended for use in skimming slag off of molten ferrous and nonferrous metals. The bar is designed so that any type of accessory, such as the skimming blade shown in the accompanying illustration, may be attached for manipulating molten metal without difficulty. Tendency of the bar toward sagging or melting is said to be eliminated.

The only replacement required is the attachment such as the skimming blade, spoon, ladle bowl or agitating head. It is claimed that such replacement is necessary only after considerable use. The bar is manufactured in any length desired and the attachment head is made of high heat resisting alloy steel castings. The anulus is made of seamless steel tubing. The water is introduced through the outer anulus and is forced to circulate to the extreme end of the skimming head through the special designed baffles to relieve back pressures that occur during the flow of the liquid, and also to relieve the discharge of liquid through the center anulus.

CLEVELAND TRAMRAIL

OVER HEAD HANDLING EQUIPMENT

● This motor operated Tramrail unit handles a ton of hot metal directly to the continuous molding loop. A floor controlled unit, as shown in the lower right of the photo, is used for pouring the mold.

ALSO BUILDERS OF CLEVELAND CRANES ALL WELDED

CLEVELAND TRAMRAIL

DIVISION OF

THE CLEVELAND CRANE & ENGINEERING CO.

1155 Depot St.

WICKLIFFE, OHIO.

Or Consult Your Phone Directory under Cleveland Tramrail

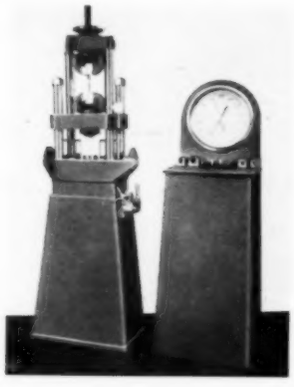
Goggles

Sellstrom Mfg. Co., 615 North Aberdeen street, Chicago, has developed a hinged frame type goggle to fit over prescription glasses and

swing up out of the way without removing head band and without disturbing the regular glasses. In this new type fit-over goggle, shown in the accompanying illustration, the frame is of light weight material attached to the head band by double hinges. The head band is attached to a fabric cap that allows the band to be adjusted loosely for comfort. It is claimed that the goggles are made to fit over all types of glasses, fitting snugly.

Testing Machine

Detroit Testing Machine Co., 5137 Trumbull avenue, Detroit, has introduced a universal testing machine shown in the accompanying illustration. It has a capacity of 60,000 pounds and can be used for tensile, transverse and compression testing. It is claimed that the load capacity is more than sufficient for all standard specimens, and the design is such that the machine may be adapted readily for special purposes. Compression space may be increased, and the screw and hand wheel on top of machine provide adjustment



for tensile specimens of different lengths.

Load is applied hydraulically by a motor driven pump. Pump, motor, reservoir, etc., are located in the base of the machine. Movement of a valve lever runs the ram up or down rapidly, and the rate of loading is maintained automatically by an auxiliary valve which may be set to suit conditions. Transverse table, post, head, etc., are full floating while tensile testing, eliminating any possibility of misalignment of specimen or friction in the ram. For transverse or compression testing the floating unit is guided in a rigid, frictionless manner. Change may be made instantly without tools.

Ram and cylinder are the ground, packless type which are said to insure consistently accurate readings. Additional load gages of different ranges and grips of various types are available to specification.

Core Ovens

Charles Wagner Litho Machinery Co., 51 Park avenue, Hoboken, N. J., is introducing a line of industrial ovens including core and mold ovens, and drying ovens. That company has been producing ovens for the metals decorating trade for the past 25 years.

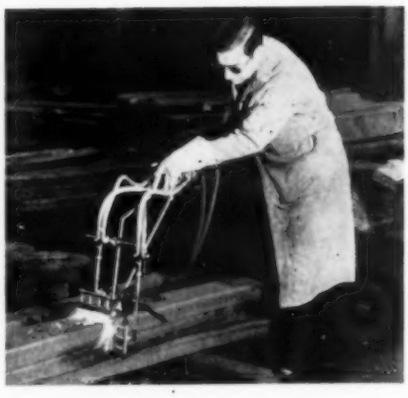
This Mixing Ladle
GIVES SLOSS IRON UNMATCHED
UNIFORMITY
The matchless uniformity of Sloss Foundry Pig Iron is not an accident—by any means. To produce foundry iron that is uniform in chemical analysis and physical properties, the Sloss smelting process is keyed at 3 vital points.
1st— Sloss blast furnaces are burdened with scientifically blended Sloss ores. (No scrap is ever used).
2nd—Sloss blast furnaces discharge molten iron into a specially designed 125-ton mixing ladle (as pictured above). This thorough mixing is an exclusive Sloss feature.
3rd— Sloss furnace men are steeped in the tradition that foundry iron is a special raw material—not a by-product. These men are so "foundry iron conscious" that the foundry iron they produce, makes your castings better.
Give Sloss Foundry Iron a try-out. A Sloss Shirt-Sleeve Service man will cooperate with your staff so you may benefit immediately from the advantages of Sloss Foundry Iron. Address inquiries to Sloss-Sheffield Steel & Iron Company, Birmingham, Alabama.
SHIRT SLEEVE SERVICE
SLOSS
SPECIALISTS IN FOUNDRY IRON
LADLE-MIXED FOR UNIFORMITY

Facing Materials

Titanium Alloy Mfg. Co., Niagara Falls, N. Y., has placed on the market two products for facing molds and cores to prevent burning-in of molten metal. One is zircon flour ground to 325 mesh which mixed with various binders is employed as a core and mold wash. The other is zircon sand which shows the following screen test: On 100 mesh, 23 per cent; through 100 and on 140 mesh, 52 per cent, and through 140 and on 200 mesh, 25 per cent. That material is used to face cores and molds to prevent burning-in also. It is claimed that both products strip clean from the castings and give a smooth surface.

Descaling Device

Air Reduction Sales Co., 60 East 42nd street, New York, recently has developed the oxyacetylene descaling apparatus shown in the accompanying illustration to remove scale and other similar accumulations from iron and steel. Deposits are heated with multiflame tips. The scale cracks off as a result of the differential expansion between the



scale and the base metal. It is claimed the process is advantageous in removing scale from ingots, billets and slabs to expose seams and defects prior to scarfing or chipping, from forgings and steel castings prior to machining and to steel castings after annealing. Where necessary the apparatus is mounted on wheel carriages. Secondary application of the apparatus is in driving the occluded moisture from within and beneath surface scale of metal to leave a dry and warm base for painting.

Electric Etcher

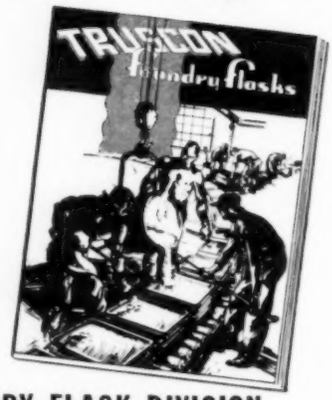
Ideal Commutator Dresser Co., Sycamore, Ill., has placed on the market an electric etcher for marking iron and steel, plain and alloyed. The etcher is used in the same manner as a pencil and engraves names, sizes, models, numbers, or other data on smooth surface parts, tools, dies, saws, plates, gears, etc., to prevent mistakes in assembly, avoid confusion in selection of tools and materials and to lessen theft and loss. The complete unit includes a hand piece and alloy point, transformer with three taps, special primary cord with tap changing switch, secondary leads of No. 8 wire and a work plate, total weight 8 pounds. Three etching speeds are controlled by the switch. Depth of etching is governed by the speed at which the point is moved over the metal.

Air Compressor

Worthington Pump & Machinery Corp., Harrison, N. J., has introduced balanced angle type air compressors in a wide variety of arrangements. These machines are for any service requiring a self-contained air or gas compressing unit. Electric motor driven tank or base mounted units with automatic start and stop control or constant speed unloaders are provided. Gasoline engine driven units equipped with either constant speed control or automatic stop may be had in either type of mounting.

Truscon Flasks Stand Up!

The Truscon Flasks illustrated have taken plenty of abuse in their 15 years of service in a Pennsylvania foundry. Yet their owner reports that *the maintenance cost on the entire lot of several hundred flasks has not exceeded $5.00 per year.* • If you want *low cost flask service,* write for the Truscon Catalog illustrated, as a starter toward that objective.



TRUSCON STEEL COMPANY • FOUNDRY FLASK DIVISION
6100 TRUSCON AVENUE • CLEVELAND, OHIO
SUBSIDIARY: Republic Steel Corporation

TRUSCON

COPPER-BEARING STEEL FOUNDRY FLASKS

For High Speed . . .

SNAGGING
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MANHATTAN

ABRASIVE WHEELS

ARE especially engineered to wear evenly . . . grind accurately and economically. Manhattan's experienced staff of specialists is equipped to recommend the wheel suited to your needs. Consult the

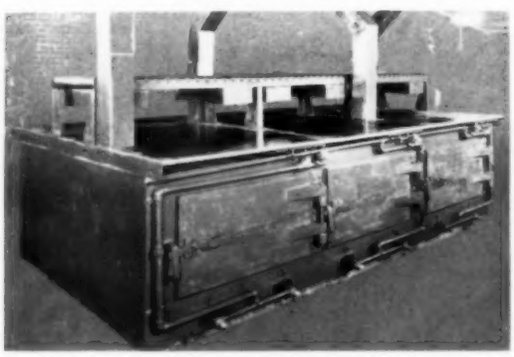
ABRASIVE WHEEL DEPARTMENT

THE MANHATTAN RUBBER MFG. DIVISION
OF RAYBESTOS-MANHATTAN, INC.
Executive Offices and Factories, 77 Townsend Street, Passaic, N. J.

SCHULTZ BENCH TYPE

Core Ovens

(Patented)



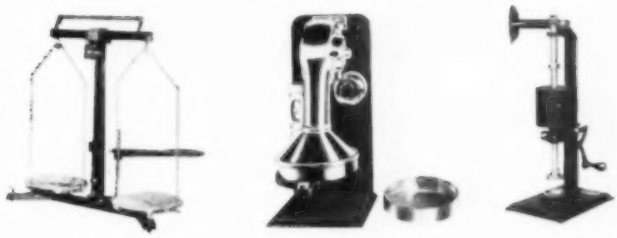
Type A—6-Man Unit

2-man, or 4-man units; Type A for fitting up, Type B for making.
For the small shop, or placed end to end for flow line production.
Reduces fatigue and increases production 25%
Reduces fuel costs 25 to 30%
Decreases floor space 25%
Each core maker completely controls his own cores, thus reducing losses.

We also handle the Herrington & Randall Industrial ovens which are tailored to fit the job.

FERDINAND G. SCHULTZ COMPANY
P. O. Box 7909
PITTSBURGH (STA. 16) PENNA.
(Pittsburgh Representatives on Nationally Advertised lines)

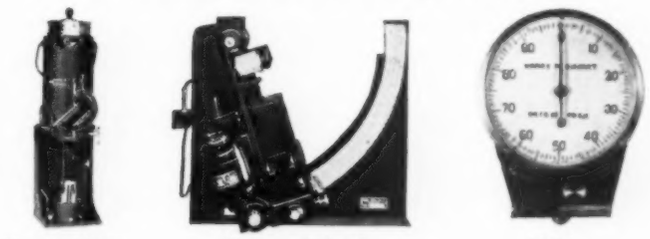
MOISTURE TEST



Balance — *Moisture Teller* — *Sand Rammer*

Moisture Testing with the Moisture Teller is the practical way for either shop or laboratory tests.

PERMEABILITY — STRENGTH — MOLD HARDNESS TEST



Permeability Meter — *Universal Sand Strength Machine* — *Mold Hardness*

Control molding sand and molds to secure better castings at a lower cost.

MODERN ANALYSIS

Carbon Determinator

Accurate carbon determinations made in two minutes with the Carbon Determinator.
Accurate sulphur determinations made in five minutes with the Sulphur Determinator.
Accurate spectrographic analysis of metals in eight minutes and less.
Speed up your laboratory to obtain chemical control in step with production that will pay dividends immediately.

MOLTEN IRON TEMPERATURE

Ferrotemp

Accurate temperature of molten grey and white iron in ladles by immersion pyrometer. Range up to 3100° F.
Economical in cost and in use. 40 Immersions cost ninety-five cents.

Write to us for

SAND TESTING — FERROTEMP — SPECTROGRAPH
QUICK CARBON DETERMINATOR — QUICK SULPHUR DETERMINATOR

HARRY W. DIETERT CO.
9330 Roselawn Ave.
DETROIT, MICH.

FOUNDRY ACTIVITIES

J. P. WARD FOUNDRY CO., Blossburg, Pa., has awarded a contract for rebuilding its foundry at an estimated cost of $100,000 to G. Case, Troy, Pa.

* * *

Mecklenburg Iron Works, Inc., Charlotte, N. C., was granted a charter to operate a machine shop, iron and brass foundry, with J. Frank Wilkes, James Renwick Wilkes Jr., and Stanley W. Black Jr., of Charlotte, as incorporators. The iron works was established in Charlotte before the Civil war and has operated as a partnership until this time.

* * *

Tiller Foundries, Sioux City, Iowa, has been incorporated with $25,000 capital to operate a general foundry business. Egil T. Miller is president.

* * *

Alemite Die Casting Co., Chicago, is drawing plans for a 1-story, 90,000-square foot factory estimated to cost approximately $200,000 to be built in Woodstock, Ill.

* * *

Ohio Steel Foundry Co., Lima, O., soon will let contracts for the construction of a 1-story 187 x 222-foot steel foundry costing $150,000. Albert Kahn Inc., Detroit, engineer.

* * *

Name of the Florence-Wehrle Stove Co., Newark, O., has been changed to the Newark Stove Co. No change has been made in ownership or management.

* * *

Index of foundry equipment orders for May, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 108.9 as compared with 146.2 in April and 90.6 in May, 1938. Index of shipments was 144.3 as compared with 131.0 in April and 91.3 in May, 1938.

* * *

Duncan Foundry & Machine Works, Alton, Ill. destroyed by fire Aug. 25, 1937, is to be rebuilt. When location of the site of the building

(*Concluded on page* 94)

• One Shepard Niles electric monorail hoist gives "express service", indoors or out to any point in the plant or yard carrying loads of every description. Furnished with single or double hooks in capacities from ⅛ to 10 tons.

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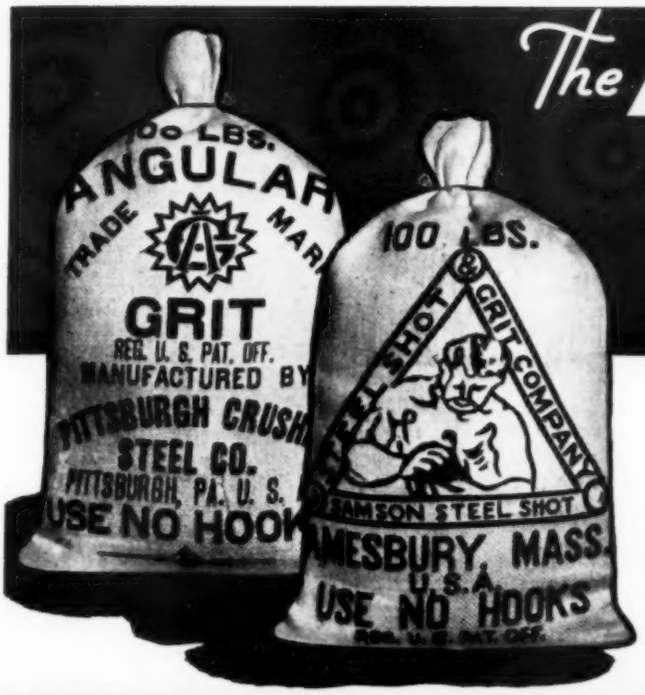
RAW MATERIAL PRICES
June 22, 1939

Iron	
No. 2 foundry, Valley	$21.00
No. 2 Southern Birmingham	17.00
No. 2 foundry, Chicago	21.00
No. 2 foundry, Buffalo	21.00
Basic, Buffalo	20.00
Basic, Valley	20.50
Malleable, Chicago	21.00
Malleable, Buffalo	21.50
Charcoal iron, furnace	25.00
Coke	
Connellsville beehive premium	$5.50 to $6.30
Wise county beehive coke	5.00 to 5.25
Detroit by-product delivered	10.25
Scrap	
Heavy melting steel, Valley, No. 2	$13.00 to $13.50
Heavy melting steel, Pittsburgh, No. 2	13.50 to 14.00
Heavy melting steel, Chicago, Auto No. 2	10.50 to 11.00
Stove plate, Buffalo	11.50 to 12.00
Stove plate, Chicago	7.75 to 8.25
No. 1 cast, mchy., New York	11.00 to 11.50
No. 1 cast, mchy., Chicago	12.00 to 12.50
No. 1 cast, Pittsburgh	15.00 to 15.50
No. 1 cast, Philadelphia	16.00 to 16.50
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	14.50 to 15.00
Car wheels, iron, Chicago	13.50 to 14.00
Railroad malleable, Chicago	15.00 to 15.50
Malleable, Buffalo	13.50 to 14.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.52½
Straits tin	49.10
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	12.00 to 12.25
Lead, New York	4.85
Antimony, New York	12.00
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.50



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has been settled with city officials, construction will go forward. Two buildings now on the site that escaped destruction in the fire, and smaller structures, will be torn down. The proposed building will be a steel structure 400 x 80 feet.

* * *

Campbell, Wyant & Cannon Foundry Co., Musekgon, Mich. is working on a small experimental order of artillery shells placed by the United States Army ordnance department as part of the national rearmament program. A small quantity of shells is being made by the centrifugal method of casting developed recently by D. J. Campbell, president of the company.

Trade Publications

MOLDING MACHINES—Herman Pneumatic Machine Co., 306 Fourth avenue, Pittsburgh, has issued a folder pointing out feature construction details of its new jolt squeeze molding machine. Also illustrated and described are its plain jarring, jarr rollover and pattern drawing, and jarr stripping machines.

HARDNESS—The International Nickel Co. Inc., 67 Wall street, New York, recently has made available a hardness conversion table for nickel alloy steels. The table is printed on a small celluloid card about 2¾ x 5 inches. In addition to the hardness conversion table, the card contains two scales in English and metric measurements, and gives standard specifications for S. A. E. nickel alloy steels.

STARTER—Magnetic motor starter is described and illustrated in booklet published by the General Electric Co., Schenectady, N. Y. Complete construction details are included.

MOTORS—A 4-page leaflet, No. 3530, recently has been published by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., illustrating and describing its line of hoist and crane motors.

FURNACES — Ajax Electrothermic Corp., Ajax Park, Trenton, N. J., has issued a folder describing and illustrating its line of electric equipment for melting, heating and laboratory work.

ELECTRODE—An 8-page booklet recently issued by General Electric Co., Schenectady, N. Y., contains tables giving electrode requirements for various types of welds for manual welding.

GRINDER—Folder describing the new contour grinder No. 150 developed by Stanley Electric Tool division, Stanley Works, New Britain, Conn., recently has been issued. Illustrations of applications together with specifications are given.

MOTORS—A 7-page booklet No. GEA-2915 describing general purpose capacitator motors has been published by General Electric Co., Schenectady, N. Y. Applications, construction characteristics, modifications and ratings are included.

Copies of any of the literature listed here may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

METAL—McKenna Metals Co., Latrobe, Pa., has issued catalog No. 2 describing its Kennametal, giving properties, size of blanks, various tables, grinding instructions. The data is supplemented by diagrams.

DRYERS — Dryers manufactured by Link-Belt Co., 307 Michigan avenue, Chicago, are described and illustrated in a 16-page book, No. 1711. Foundry sand is one of the materials handled by the dryer.

TOOLS—Van Dorn Electric Tool Co., Towson, Md., has issued recently its 1339 catalog covering its entire line of portable electric tools and accessories. All equipment is illustrated and specifications are included.

DE-GASER—Folder describing a product of Foundry Services Inc., 107 East Forty-first street, New York, for remoing gas from aluminum alloys containing magnesium, has been issued recently by that company.

ALLOYS — Blackwell's Metallurgical Works Ltd., Speke Road Works, Garston, Liverpool, 19, England, has issued an 11-page booklet No. 10 covering its entire line of alloys for iron, steel, brass, copper, bronze and aluminum founders.

ROD STRAIGHTENER — American Foundry Equipment Co., 555 Byrkit street, Mishawaka, Ind., has published a revised bulletin on its rod straightener and shear machine. The bulletin illustrates all sizes and types of rod straighteners including complete construction

(*Concluded on page 96*)

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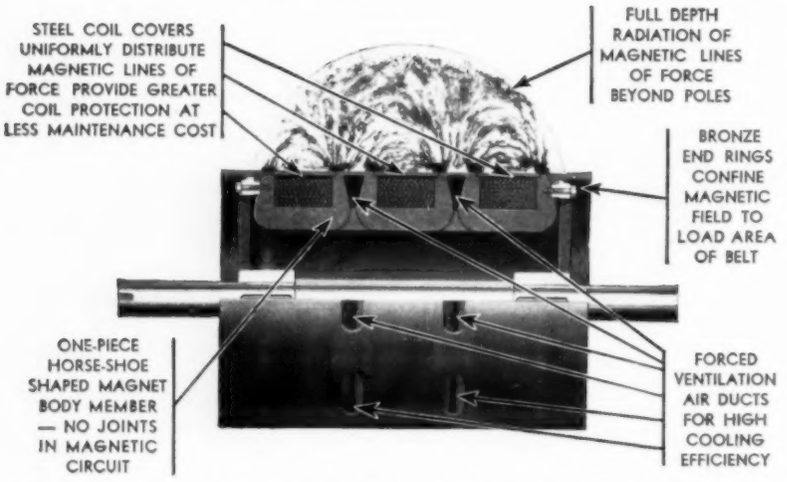
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(INCORPORATED)

(*Concluded from page* 94)

and mechanical details as well as specifications and operating data.

PUMPS—Deep well turbine pumps, types QE and QAE are described in a 4-page folder prepared by Worthington Pump & Machinery Corp., Harrison, N. J. Diagram of the pumps, together with illustrations of the various parts are included.

CONVEYOR—Johns Conveyor division, Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland, has issued a 7-page booklet describing the operation of its conveyor and giving illustrations of applications. Also included is a table giving capacities of the various conveyor sizes.

GEAR MOTORS—General Electric Co., Schenectady, N. Y., has published a 12-page booklet giving information on integral and fractional horsepower gear motors for low speed operation. It includes construction features, selection and application and types and ratings.

PLASTICS—Bakelite Corp., 247 Park avenue, New York, has issued a 15-page booklet "New Paths to Profits," describing the applications of its various plastics. Of particular interest to foundrymen is the description of its resinoid bonding materials for use in bonding abrasives.

TUBING—American Metal Hose branch of the American Brass Co., Waterbury, Conn., has issued a 24-page book on seamless flexible metal tubing. Included is the description of its manufacture and illustrations of its application in various industries. Proper methods of installation are described as well.

FACINGS—Titanium Alloy Mfg. Co., Niagara Falls, N. Y., has issued a 4-page folder describing its zircon flour and zircon sand for preventing burning in of molten metal. The flour is used as a mold and core wash, while the sand is employed as a facing on the mold or core. Information is given on mixtures of the materials for foundry use.

MOLYBDENUM—Climax Molybdenum Co., 500 Fifth avenue, New York, recently issued section 5 of "Molybdenum in Gray Iron." This section covers high strength and heavy sections. The booklet contains a table giving the analyses and physical properties of gray cast iron and halftone illustrations of micrographs and applications of cast iron alloyed with molybdenum.

ACETYLENE—Linde Air Products Co., 205 East Forty-second street, New York, has issued a 40-page book "Cold Weather Care of Acetylene Generating and Distributing Equipment." The book presents pointers on how to prevent freezing of acetylene generators, hydraulic back-pressure valves, distribution piping and hose, regulators, relief valves and water-cooled blowpipes, together with suggestions for procedures where freezing has occurred.

FOUNDRY EQUIPMENT—General catalog 800 has been issued by Link-Belt Co., 307 North Michigan avenue, Chicago. Approximately 1278 pages are devoted to power transmission equipment for handling, screening, drying, cooling, and preparing materials mechanically. It gives list prices, dimensions, weights, and contains much engineering data. A 44-page pictorial section in the forepart of the book affords the reader a general view of the many products that the company makes. The catalog also contains information an extensive line of power transmission equipment and various forms of positive drives, as well as 29 pages of useful engineering tables and data in convenient form for handy reference. Requests for the catalog should be made on company letterhead.

OBITUARY

WALTER J. MILLER, 50, president and general manager, Keokuk Steel Casting Co., Keokuk, Iowa, died recently in Yosemite National Park, Calif. Mr. Miller was born in Milwaukee on Oct. 3, 1888, and lived for a time in Denver, Colo. as well as in Milwaukee. His first work was with the Harrison Steel Castings Co., Attica, Ind. After 5 years with the Harrison company Mr. Miller bought the Northwestern Steel Casting Co., Minneapolis which in 1927 merged with Foote Gear & Machine Co., Chicago. In 1930 he sold his interests in that company and became manager of American Steel Foundries in Pittsburgh. It was in 1936 that Mr. Miller purchased the Keokuk Steel Casting Co.

* * *

Anton J. Zergott, 39, chief timekeeper for the Ferro Machine & Foundry Co., Cleveland, and an employe of that company for more than 20 years, died recently in that city. Mr. Zergott went to Cleveland from Poland in 1906.

* * *

David E. Knall, 47, vice president, Calumet Foundry & Machine Co., East Chicago, Ind., died June 11. Mr. Knall had been connected with the Calumet foundry company for 20 years and was widely known in steel circles. He was a member of the Iron and Steel institute.

* * *

Michael J. Gilmore, 71, retired superintendent, City Foundry Co., Cleveland, died recently at his home in that city after an illness of more than a year. Mr. Gilmore was born in County Mayo, Ireland and came to this country when 18 years of age. Shortly afterward he went to work for the foundry company, later becoming superintendent.

* * *

Claus A. Johnson, 75, formerly plant superintendent of the Superior Foundry Co., Cleveland, died recently in that city. Mr. Johnson came to the United States from Sweden in 1881 and went to work in a Chicago foundry. In 1897 he moved to Springfield, O., to work for the Wickman-Chapman Piano Plate Co. as skilled mechanic. He moved to Cleveland in 1904 and became associated with the Superior Foundry Co. which had just put up a plant for the manufacture of piano plates. When Mr. Johnson retired in 1922 he was plant superintendent.

* * *

James MacIntosh, 51, superintendent of the iron foundry, Sacks Barlow Foundries Inc., Newark, N. J., died at the Beth Israel hospital, Newark, June 4. Born in Brooklyn, he had been affiliated with the foundry industry for more than 35 years. He obtained his apprenticeship training at the Elizabethport, N. J., plant of the Worthington Pump & Machinery Corp. where he remained 6 years. He then served several years at other plants including the Elizabethport foundry of the Bethlehem Steel Co., and about 20 years ago joined the Sacks organization, then known as the Lewis Sacks Iron Foundry, as foreman. He was prominent in local foundry affairs and was long active in the New Jersey Foundrymen's association.

* * *

Everett W. Pike, 70 superintendent, the Detroit Steel Casting Co., Detroit, died recently in that city. Mr. Pike was born April 27, 1869 in Livermore Falls, Me., and was raised and received his elementary education in Harrisburg, Pa. He started to serve his apprenticeship in 1886 in what was then known as the Pennsylvania Steel Co., Steelton, Pa. About 1898 he became connected with the Burnham Steel plant at Burnham, Pa., where he was foundry foreman and later was made night superintendent. In 1908 Mr. Pike went to Cleveland to accept the position of superintendent and vice president of the West Steel Casting Co. In 1913 he joined the Treadwell Engineering Co., Easton, Pa., which company he left in 6 months to become associated with the Detroit Steel Casting Co. In 1915 he was made superintendent of that company, the position he occupied up to the time of his death. Mr. Pike received his high school education in night classes at the Y. M. C. A. and received further education from correspondence courses in foundry practice and metallurgy and also extension courses of the University of Michigan.

Book Review

Automobile, by Georges Mohr, fabrikoid, 531 pages, 3¾ x 5¾ inches, published by Dunod, Paris, France, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Fenton Publishing Co. Ltd., London.

This French volume is a compendium of information for automobile engineers and others associated with the industry. The volume is pocket size, and is divided into three main divisions of which the first is concerned with formulas for study and construction of motors and automobiles, and contains summaries on mathematics, physics, mechanics, chemistry, etc. The second section is devoted to materials of construction of automobiles while the third deals with motors, clutches, gear shifts, transmissions, differentials, brakes, etc.

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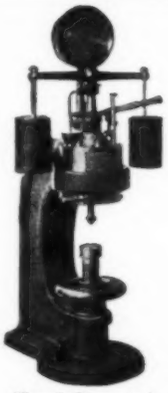

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ABSTRACTS . . . . . .

FROM WORLD LITERATURE

Silicon Bronze

Nonferrous Foundry Practice, XIX—Silicon Bronzes and Brasses, by J. Laing and R. T. Rolfe, *Metal Industry,* London, England, March 17, 1939.

This article is the nineteenth of a series dealing with nonferrous foundry practice, and discusses compositions and properties of silicon bronzes, such as everdur, herculoy, p.m.g. metal which contain from 3 to 5 per cent silicon and small amounts of such metals as manganese, iron and zinc. Constitution of the alloys is discussed as is molding practice. Silicon brasses which in addition to the silicon contain appreciable quantities of zinc also are described with data on molding and melting practice.

Nickel Silver

Nonferrous Foundry Practice, by J. Laing and R. T. Rolfe, *The Metal Industry,* London, England, March 24, 1939.

This article forms part XX of a series on nonferrous foundry practice, and relates to nickel silver, german silver, white brass, nickeline, etc. It covers classification and uses, color and corrosion resistance, nonmetallic impurities, metallic additions, mechanical properties, molding technique, casting temperature, melting practice, and melting practice with virgin metals.

A molding sand of good permeability is desirable, and except for small castings the dry sand method is preferable. Gating should follow steel foundry practice. It is desirable to pour fairly rapidly from the bottom, and cross sectional area of gates adjacent to casting should not be too large or sponginess will occur. In-gates should be thin and moderatly wide. Desirable casting temperature is 1250 to 1350 degrees Cent. (2280 to 2460 degrees Fahr.)

Copper-Nickel

Nonferrous Foundry Practice, by J. Laing and R. T. Rolfe, *The Metal Industry,* London, England, April 7, 1939.

This article, forming part XXI of a series, discusses the mechanical properties of copper-nickel alloys, precipitation hardening, cast copper-nickel alloys and their properties, monel metal and modifications of that material, etc. The article also presents information on foundry and melting practice for the alloys, pouring temperature, molding technique, and runner gates and risers.

Cast Centrifugally

Comments on the Advantages of the Centrifugal Casting of Copper Alloys (Considerations sur les Avantages de la Coulee Centrifuge des Alliages Cuivreux), by Henry Strube, *Bulletin* of the Association Technique de Fonderie, Paris, France, January, 1939.

The author lists the following advantages of centrifugally cast copper alloys: Considerable improvement in mechanical properties which is advantageous for heavy stresses and severe conditions subject to wear (bearings, gears, etc.); uniformity of composition throughout the casting, hence uniform structure insuring equal resistance to wear, solidity and absence of microscopic pores making centrifugally cast alloys particularly suitable for heavy pressure without risk of developing leaks or porous spots; fine texture of external surfaces will take high polish, making castings suitable for paper making rolls, etc.; possibility of obtaining practically pure castings of all copper alloys with almost no rejects and without any surface or internal defects as required of certain applications in the electrical industry. Additional advantages include decreased labor cost, elimination of gates and risers, and lack of defects after machining.

Gray Cast Iron

Is Gray Cast Iron in General To Be Replaced as a Construction Material? (Ist Grauguss als Baustoff ueberhaupt zu ersetzen?), by R. Bertschinger, *Die Giesserei,* Duesseldorf, Germany, Feb. 10, 1939.

General inarticulateness and lack of knowledge on mechanical properties of gray iron among its producers has in many cases permitted the substitution of other materials for that product. In this article the author points out that gray cast iron has numerous valuable properties which for certain purposes cannot be approached by the substitute materials. He makes an excellent case for gray iron and calls on its producers to stick together. Ways and means to combat misunderstanding and misconceptions relating to gray iron are suggested.

Alloy Cast Iron

Alloy Cast Iron, by H. A. MacColl, *Foundry Trade Journal,* London, England, March 2, March 9, March 16, and March 23, 1939.

This series of articles constitutes a comprehensive review of alloy cast irons beginning with the various structural components of cast iron, effect of various alloying agents such as nickel, chromium, molybdenum, vanadium, and copper. The author then discusses heat treatable cast iron, heat resisting irons, inoculated irons, the production angle, and closes with the procedures for adding the various alloying elements.

Aluminum

Nonferrous Foundry Practice, by J. Laing and R. T. Rolfe, *The Metal Industry,* London, England, April 28, 1939.

This article, forming part XXII of a series, serves as the introduction to information on aluminum alloys, since it mainly is concerned with descriptions of the various types of alloy available to the foundryman with data on their properties. Types of alloys discussed include the zinc-aluminum, copper-aluminum, heat treatable copper alloys, complex copper-aluminum alloys, complex high-copper alloys, silicon-aluminum alloys, complex low and high silicon alloys, and magnesium-aluminum alloys.

Malleable Iron

Investigation Upon the Current State of the Mechanical Properties of Malleable Cast Iron (Untersuchungen ueber den heutigen Stand der mechanischen Eigenschaften von Temperguss), by H. Dittmar, *Die Giesserei,* Duesseldorf, Germany, March 24, 1939.

This article presents data on an investigation to determine proper size of test bar for standard specifications. The older bar previously used had a length to diameter ratio of 1:5, but the investigation showed that more concordant results are obtained with a length to diameter ratio of 1:3 which is approximately that of the A. S. T. M. bar. Both black heart and white heart malleable cast iron specimens were used. The author states that improvements in melting and heat treatment in production of white and black heart irons have led to a betterment of mechanical properties. Data obtained give the designer new figures for calculation, and show the possibilities of both materials for highly stressed construction elements.

Molybdenum in Iron

Molybdenum in Cast Iron, by W. F. Chubb, *Foundry Trade Journal,* London, England, March 30, 1939.

The author discusses effects of molybdenum additions to gray iron. He describes methods of adding that element, metallographic influence of molybdenum on iron-carbon alloys, and then outlines results obtained from addition of molybdenum alone. From that point he turns to a description of the addition of molybdenum and a second alloying agent such as nickel and as chromium, presenting data on the properties attained in such combinations.

Magnesium Alloys

Protecting Magnesium Alloys, by E. G. Savage, *The Metal Industry,* London, England, April 21, 1939.

Since all magnesium alloys need protection against corrosion except when used under the most favorable conditions, the author briefly outlines various procedures aimed to give such protection. He points out that chemical immersion treatments are in most general use at present although these appear likely to be superseded by anodic treatment where problems of throwing power and cost are not acute. He then describes in considerable detail two hot bath processes developed at the Royal Aircraft establishment.

One process requires 6 hours immersion, and the other only 30 minutes. The bath is used at the boiling point and contains 3 per cent by weight ammonium sulphate, 1.5 per cent by weight ammonium dichromate, 1.5 per cent by weight potassium dichromate, and 0.3 per cent by volume ammonia (sp. gr. 0.880). The author also gives information on preparation of material for treatment, stripping, stopping off, equipment, and supplementary protectives.